# MG0301C

# π/4 DQPSK Modulation Unit

# Operation Manual
(GPIB Remote Control)

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# 1. GENERAL

The MG0301C π/4DQPSK Modulation Unit is one of the units used with the MG3670 series • MG3660A Digital Modulation Signal Generator.

This GPIB remote control part provides the MG0301C device message list, its detailed descriptions , and some sample programs with those commands specific to the MG0301C.

For other description of GPIB, refer to the GPIB Remote Control part in the MG3670 series • MG3660A Digital Modulation Signal Generator Operation Manual.

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# 2. MG0301C DEVICE MESSAGE LIST

The tables on the following pages list the command messages, query messages, and response messages specific to the MG0301C π/4DQPSK Modulation Unit.

## 2.1 How to Read the MG0301C Device Message List

### (1) Command Messages (Command Msg)/Query Message (Query Msg)

| | |
|---|---|
| (a) Upper-case: | Reserved word |
| (b) Number: | Reserved word (Number code) |
| (c) Lower-case argument | |
| n (Integral number): | Numeric data (NR1 format) |
| h (hexadecimal number): | Numeric data (hexadecimal data) |
| s: | Character string enclosed by double quotation marks (" ") or single quotation marks (' ') |

### (2) Response message (Response Msg)

| | |
|---|---|
| (a) Upper-case: | Reserved word |
| (b) Number: | Reserved word (Number code) |
| (c) Lower-case argument | |
| n (Integral number): | Numeric data (NR1 format) |
| h (hexadecimal number): | Numeric data (hexadecimal data) |

**Note:** • *If the header is set to Off, then the response message header and the numeric data suffix code are not transferred. (Initial setting: Header Off)*

- ␣ *means a space of one character.*
- Ø *indicates a zero.*

## 2.2 MG0301C Device Message List

### (1) Modulation

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets I,Q signal source | Modulation Mode Source | | | |
| | I, Q Int | MODE␣INT | MODE? | MODE␣INT |
| | I, Q Ext | MODE␣EXT | MODE? | MODE␣EXT |
| Sets nyquist filter type | Nyquist Filter Type | | | |
| | Root Nyquist | NYQ␣R | NYQ? | NYQ␣R |
| | Nyquist | NYQ␣N | NYQ? | NYQ␣N |
| Differential phase encoding | Differential Phase Encoding | | | |
| | Normal | DPE␣NORM | DPE? | DPE␣NORM |
| | Invers | DPE␣INVS | DPE? | DPE␣INVS |
| Sets internal modulation data (BURST OFF) | Pattern | | | |
| | 0000 | PAT␣0000 | PAT? | PAT␣0000 |
| | 0001 | PAT␣0001 | PAT? | PAT␣0001 |
| | 0010 | PAT␣0010 | PAT? | PAT␣0010 |
| | 0011 | PAT␣0011 | PAT? | PAT␣0011 |
| | 0100 | PAT␣0100 | PAT? | PAT␣0100 |
| | 0101 | PAT␣0101 | PAT? | PAT␣0101 |
| | 0110 | PAT␣0110 | PAT? | PAT␣0110 |
| | 0111 | PAT␣0111 | PAT? | PAT␣0111 |
| | 1000 | PAT␣1000 | PAT? | PAT␣1000 |
| | 1001 | PAT␣1001 | PAT? | PAT␣1001 |
| | 1010 | PAT␣1010 | PAT? | PAT␣1010 |
| | 1011 | PAT␣1011 | PAT? | PAT␣1011 |
| | 1100 | PAT␣1100 | PAT? | PAT␣1100 |
| | 1101 | PAT␣1101 | PAT? | PAT␣1101 |
| | 1110 | PAT␣1110 | PAT? | PAT␣1110 |
| | 1111 | PAT␣1111 | PAT? | PAT␣1111 |
| | PN15 | PAT␣PN15 | PAT? | PAT␣PN15 |
| | PN9 | PAT␣PN9 | PAT? | PAT␣PN9 |
| Turns Burst function on or off | Burst | | | |
| | On | BST␣ON | BST? | BST␣ON |
| | Off | BST␣OFF | BST? | BST␣OFF |
| Sets burst trigger source | Burst Trigger | | | |
| | Int | BTG␣INT | BTG? | BTG␣INT |
| | Ext | BTG␣EXT | BTG? | BTG␣EXT |
| Changes symbol adjust state | Symbol Adjust | SAD | ——— | ——— |
| Sets timing of the burst trigger | Burst Trigger Select | | | |
| | Uplink | TGS␣UP | TGS? | TGS␣UP |
| | Downlink | TGS␣DN | TGS? | TGS␣DN |

## (2) Internal modulation data

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Selects communication systems | System | | | |
| | PDC | SYS␣PDC | SYS? | SYS␣PDC |
| | PDC_H | SYS␣PDC_H | SYS? | SYS␣PDC_H |
| | PHP | SYS␣PHP | SYS? | SYS␣PHP |
| | NADC | SYS␣NADC | SYS? | SYS␣NADC |
| | TFTS | SYS␣TFTS | SYS? | SYS␣TFTS |
| Sets internal modulation data (BURST ON) | Pattern | | | |
| | PDC / PDC_H | | | |
| | DEVICE | PAT␣DEV | PAT? | PAT␣DEV |
| | UP TCH | PAT␣UPT | PAT? | PAT␣UPT |
| | UP TCH ALL | PAT␣UPTA | PAT? | PAT␣UPTA |
| | UP VOX | PAT␣UPVX | PAT? | PAT␣UPVX |
| | DOWN TCH | PAT␣DNT | PAT? | PAT␣DNT |
| | DOWN TCH ALL | PAT␣DNTA | PAT? | PAT␣DNTA |
| | PHP | | | |
| | UP DEVICE | PAT␣UPDV | PAT? | PAT␣UPDV |
| | DOWN DEVICE | PAT␣DNDV | PAT? | PAT␣DNDV |
| | UP TCH | PAT␣UPT | PAT? | PAT␣UPT |
| | UP TCH ALL | PAT␣UPTA | PAT? | PAT␣UPTA |
| | DOWN TCH | PAT␣DNT | PAT? | PAT␣DNT |
| | DOWN TCH ALL | PAT␣DNTA | PAT? | PAT␣DNTA |
| | UP VOX | PAT␣UPVX | PAT? | PAT␣UPVX |
| | DOWN VOX | PAT␣DNVX | PAT? | PAT␣DNVX |
| | UP SYNC | PAT␣UPSYNC | PAT? | PAT␣UPSYNC |
| | DOWN SYNC | PAT␣DNSYNC | PAT? | PAT␣DNSYNC |
| | NADC | | | |
| | DEVICE | PAT␣DEV | PAT? | PAT␣DEV |
| | UP TCH | PAT␣UPT | PAT? | PAT␣UPT |
| | UP TCH ALL | PAT␣UPTA | PAT? | PAT␣UPTA |
| | DOWN TCH | PAT␣DNT | PAT? | PAT␣DNT |
| | DOWN TCH ALL | PAT␣DNTA | PAT? | PAT␣DNTA |
| | TFTS | | | |
| | DEVICE | PAT␣DEV | PAT? | PAT␣DEV |
| | UP TCH | PAT␣UPT | PAT? | PAT␣UPT |
| | UP TCH ALL | PAT␣UPTA | PAT? | PAT␣UPTA |
| | DOWN TCH | PAT␣DNT | PAT? | PAT␣DNT |
| | DOWN TCH ALL | PAT␣DNTA | PAT? | PAT␣DNTA |
| | Memory | PAT␣MEMn | PAT? | PAT␣MEMn |

## (3) Setting the slot

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Selects slot number | Select Slot Number | SLOTNO␣n | SLOTNO? | SLOTNO␣n |
| Sets the slot | Modify Slot | | | |
| | PDC / PDC_H | | | |
| | DEVICE: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH: | | | |
| | UP TCH | SLOT␣UPT | SLOT? | SLOT␣UPT |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH ALL: | | | |
| | UP TCH | SLOT␣UPT | SLOT? | SLOT␣UPT |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP VOX: | | | |
| | UP TCH | SLOT␣UPT | SLOT? | SLOT␣UPT |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH ALL: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | PHP | | | |
| | UP DEVICE: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN DEVICE: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH ALL: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH: | | | |
| | DOWN TCH | SLOT␣DNT | SLOT? | SLOT␣DNT |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |

(Continued)

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets the slot (Continued) | DOWN TCH ALL: | | | |
| | DOWN TCH | SLOT␣DNT | SLOT? | SLOT␣DNT |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP VOX: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN VOX: | | | |
| | DOWN TCH | SLOT␣DNT | SLOT? | SLOT␣DNT |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP SYNC: | | | |
| | UP TCH | SLOT␣UPT | SLOT? | SLOT␣UPT |
| | UP SYNC | SLOT␣UPSYNC | SLOT? | SLOT␣UPSYNC |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN SYNC: | | | |
| | DOWN TCH | SLOT␣DNT | SLOT? | SLOT␣DNT |
| | DOWN SYNC | SLOT␣DNSYNC | SLOT? | SLOT␣DNSYNC |
| | VOX | SLOT␣VOX | SLOT? | SLOT␣VOX |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | NADC DEVICE: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH ALL: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH ALL: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | TFTS DEVICE: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |

(Continued)

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets the slot (Continued) | UP TCH: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | UP TCH ALL: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |
| | DOWN TCH ALL: | | | |
| | On | SLOT␣ON | SLOT? | SLOT␣ON |
| | Off | SLOT␣OFF | SLOT? | SLOT␣OFF |

## (4) Setting data of the pattern

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets data of the pattern | Pattern Edit | | | |
| | PDC / PDC_H | | | |
| | DEVICE:PN | | | |
| | PN9 | PN␣PN9 | PN? | PN␣PN9 |
| | PN15 | PN␣PN15 | PN? | PN␣PN15 |
| | UP TCH:CC | CC␣h | CC? | CC␣h |
| | UP TCH:SACCH | SACCHh | SACCH? | SACCH␣h |
| | UP TCH:SW | SW␣h | SW? | SW␣h |
| | UP TCH:TCH | | | |
| | PN9 | TCH␣PN9 | TCH? | TCH␣PN9 |
| | PN15 | TCH␣PN15 | TCH? | TCH␣PN15 |
| | UP TCH:Scramble | | | |
| | ON | SCBL␣ON | SCBL? | SCBL␣ON |
| | OFF | SCBL␣OFF | SCBL? | SCBL␣OFF |
| | UP TCH:Scramble Code | SCBLC␣h | SCBLC? | SCBLC␣h |
| | DOWN TCH:CC | CC␣h | CC? | CC␣h |
| | DOWN TCH:SACCH | SACCH␣h | SACCH? | SACCH␣h |
| | DOWN TCH:SW | SW␣h | SW? | SW␣h |
| | DOWN TCH:TCH | | | |
| | PN9 | TCH␣PN9 | TCH? | TCH␣PN9 |
| | PN15 | TCH␣PN15 | TCH? | TCH␣PN15 |

(Continued)

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets data of the pattern (Continued) | Pattern Edit | | | |
| | DOWN TCH:Scramble | | | |
| | ON | SCBL␣ON | SCBL? | SCBL␣ON |
| | OFF | SCBL␣OFF | SCBL? | SCBL␣OFF |
| | DOWN TCH:Scramble Code | SCBLC␣h | SCBLC? | SCBLC␣h |
| | VOX:CC | CC␣h | CC? | CC␣h |
| | VOX:SACCH | SACCH␣h | SACCH? | SACCH␣h |
| | VOX:SW | SW␣h | SW? | SW␣h |
| | VOX:Scramble | | | |
| | ON | SCBL␣ON | SCBL? | SCBL␣ON |
| | OFF | SCBL␣OFF | SCBL? | SCBL␣OFF |
| | VOX:Scramble Code | SCBLC␣h | SCBLC? | SCBLC␣h |
| | PHP | | | |
| | DEVICE:PN | | | |
| | PN9 | PN␣PN9 | PN? | PN␣PN9 |
| | PN15 | PN␣PN15 | PN? | PN␣PN15 |
| | TCH:UW | UW␣h | UW? | UW␣h |
| | TCH:SA | SA␣h | SA? | SA␣h |
| | TCH:TCH | | | |
| | PN9 | TCH␣PN9 | TCH? | TCH␣PN9 |
| | PN15 | TCH␣PN15 | TCH? | TCH␣PN15 |
| | TCH:CS-ID Scramble | | | |
| | ON | SCBL␣ON | SCBL? | SCBL␣ON |
| | OFF | SCBL␣OFF | SCBL? | SCBL␣OFF |
| | TCH:CS-ID Code | SCBLC␣h | SCBLC? | SCBLC␣h |
| | TCH:Secret Scramble | | | |
| | ON | SCRT␣ON | SCRT? | SCRT␣ON |
| | OFF | SCRT␣OFF | SCRT? | SCRT␣OFF |
| | TCH:Secret Code | SCRTC␣h | SCRTC? | SCRTC␣h |
| | VOX:UW | UW␣h | UW? | UW␣h |
| | VOX:SA | SA␣h | SA? | SA␣h |
| | VOX:VOX | | | |
| | PN9 | VOX␣PN9 | VOX? | VOX␣PN9 |
| | PN15 | VOX␣PN15 | VOX? | VOX␣PN15 |

(Continued)

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets data of the pattern (Continued) | Pattern Edit | | | |
| | VOX:CS-ID Scramble | | | |
| | ON | SCBL␣ON | SCBL? | SCBL␣ON |
| | OFF | SCBL␣OFF | SCBL? | SCBL␣OFF |
| | VOX:CS-ID Code | SCBLC␣h | SCBLC? | SCBLC␣h |
| | VOX:Secret Scramble | | | |
| | ON | SCRT␣ON | SCRT? | SCRT␣ON |
| | OFF | SCRT␣OFF | SCRT? | SCRT␣OFF |
| | VOX:Secret Code | SCRTC␣h | SCRTC? | SCRTC␣h |
| | SYNC:UW | UW␣h | UW? | UW␣h |
| | SYNC:CI | CI␣h | CI? | CI␣h |
| | SYNC:CS-ID | CSID␣h | CSID? | CSID␣h |
| | SYNC:PS-ID | PSID␣h | PSID? | PSID␣h |
| | SYNC:Idle | IDLE␣h | IDLE? | IDLE␣h |
| | SYNC:Scramble | | | |
| | ON | SCBL␣ON | SCBL? | SCBL␣ON |
| | OFF | SCBL␣OFF | SCBL? | SCBL␣OFF |
| | SYNC:Scramble Code | SCBLC␣h | SCBLC? | SCBLC␣h |
| | NADC | | | |
| | DEVICE:PN | | | |
| | PN9 | PN␣PN9 | PN? | PN␣PN9 |
| | PN15 | PN␣PN15 | PN? | PN␣PN15 |
| | UP TCH:CDVCC | CDVCC␣h | CDVCC? | CDVCC␣h |
| | UP TCH:SACCH | SACCH␣h | SACCH? | SACCH␣h |
| | UP TCH:SYNC | SYNC␣h | SYNC? | SYNC␣h |
| | UP TCH:DATA | | | |
| | PN9 | DATA␣PN9 | DATA? | DATA␣PN9 |
| | PN15 | DATA␣PN15 | DATA? | DATA␣PN15 |
| | DOWN TCH:CDVCC | CDVCC␣h | CDVCC? | CDVCC␣h |
| | DOWN TCH:SACCH | SACCH␣h | SACCH? | SACCH␣h |
| | DOWN TCH:SYNC | SYNC␣h | SYNC? | SYNC␣h |
| | DOWN TCH:DATA | | | |
| | PN9 | DATA␣PN9 | DATA? | DATA␣PN9 |
| | PN15 | DATA␣PN15 | DATA? | DATA␣PN15 |

(Continued)

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Sets data of the pattern (Continued) | Pattern Edit | | | |
| | TFTS | | | |
| | DEVICE:PN | | | |
| | PN9 | PN␣PN9 | PN? | PN␣PN9 |
| | PN15 | PN␣PN15 | PN? | PN␣PN15 |
| | TCH:S | S␣h | S? | S␣h |
| | TCH:DATA | | | |
| | PN9 | DATA␣PN9 | DATA? | DATA␣PN9 |
| | PN15 | DATA␣PN15 | DATA? | DATA␣PN15 |

## (5) Save

| Measurement paramete | | Command Msg | Query Msg | Response Msg |
|---|---|---|---|---|
| Brief Function | Control Item | | | |
| Saves burst internal modulation data | Burst Pattern Memory Save | BSAV␣n[,s]† | ——— | ——— |

† It is possible to omit 's'(Title).

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# 3. DETAILED DESCRIPTION OF COMMANDS

This section describes in detail the device messages for MG0301C π/4DQPSK Modulation Unit. The device messages are listed in alphabetical.

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## BSAV Burst Pattern Memory Save

■ Function

Saves the burst internal modulation data to burst pattern memory.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| BSAV | BSAV␣a[,b] | ——— | ——— |

■ Value of a Ø to 99

■ Value of b Character string whithin 8 characters enclosed by double quotation marks or single quotation marks.
Saves the title which is sets currently if b is omitted.
Saves the first eight characters of b if b is over eight characters.

■ Suffix code None

■ Example BSAV␣5, "MG367ØB"

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## BST Burst On/Off

■ Function

Turns the Burst function on or off.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| BST | BST␣a | BST? | BST␣a |

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting OFF

■ Example BST␣ON

## BTG Burst Trigger Source

■ Function Sets the burst trigger source to either internal (Int) or external (Ext). (When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| BTG | BTG␣a | BTG? | BTG␣a |

■ Value of a
INT: Internal burst trigger
EXT: External burst trigger

■ Suffix code None

■ Initial setting INT

■ Example BTG␣EXT

# C

## CC Color Code

■ Function

Sets the CC data of VOX/UP TCH/DOWN TCH slot in the PDC/PDC_H.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| CC | CC␣a | CC? | CC␣a |

■ Value of a #HØØ to #HFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #HØØ

■ Example CC␣#H3F

---

## CDVCC Coded Digital Verification Color Code

■ Function

Sets the CDVCC data of UP TCH/DOWN TCH slot in the NADC.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| CDVCC | CDVCC␣a | CDVCC? | CDVCC␣a |

■ Value of a #HØØØ to #HFFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #HØØØ

■ Example CDVCC␣#HAAA

## CI Channel Identifier

■ Function Sets the CI data of SYNC slot in the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| CI | CI␣a | CI? | CI␣a |

■ Value of a #HØ to #HF (Hexadecimal number)
■ Suffix code None
■ Initial setting #H9
■ Example CI␣#HF

---

## CSID CS Identification Code

■ Function Sets the CS-ID data of SYNC slot in the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| CSID | CSID␣a | CSID? | CSID␣a |

■ Value of a #HØØØØØØØØØØØ to #H3FFFFFFFFF (Hexadecimal number)
■ Suffix code None
■ Initial setting #H20200020001
■ Example CSID␣#H20200020003

## DATA Data

■ Function

Sets parameter data (DATA) for UP-TCH/DOWN-TCH slots of the NADC system or TCH of the TFTS system when the burst function unit is installed.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| DATA | DATA␣a | DATA? | DATA␣a |

■ Value of a PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example DATA␣PN15

---

## DPE Differential Phase Encoding

■ Function

Sets the differential phase encoding specifications for $\pi$/4DQPSK modulation when a $\pi$/4DQPSK modulation system is selected.

| Header | Program command | Query | Response |
|---|---|---|---|
| DATA | DATA␣a | DATA? | DATA␣a |

■ Value of a NORM : Normal
INVS : Inverse (inverted differential phase encoding)

■ Suffix code None

■ Initial setting NORM

■ Example DPE␣INVS

## IDLE Idle Bit

■ Function

Sets the Idle data of SYNC slot in the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| IDLE | IDLE␣a | IDLE? | IDLE␣a |

■ Value of a #H0000000000 to #H3FFFFFFFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #H0000000000

■ Example IDLE␣#H3AAAAAAAA

## MODE Modulation Mode Source

■ Function Sets the I,Q signals source to either internal (Int) or external (Ext).

| Header | Program command | Query | Response |
|---|---|---|---|
| MODE | MODE␣a | MODE? | MODE␣a |

■ Value of a
INT: Internal I,Q signals
EXT: External I,Q signals

■ Suffix code None

■ Initial setting INT

■ Example MODE␣EXT

## NYQ Nyquist Filter Type

■ Function Sets the nyquist filter type to either Root Nyquist or Nyquist .

| Header | Program command | Query | Response |
|---|---|---|---|
| NYQ | NYQ␣a | NYQ? | NYQ␣a |

■ Value of a
R: Root Nyquist
N: Nyquist

■ Suffix code None

■ Initial setting R

■ Example NYQ␣N

## PAT Pattern

■ Function

Sets the internal modulation data pattern when the burst function turns on. (When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| PAT | PAT␣a | PAT? | PAT␣a |

■ Value of a

When system is PDC/PDC_H

| | |
|---|---|
| DEV: | DEVICE |
| UPT: | UP TCH |
| UPTA: | UP TCH ALL |
| UPVX: | UP VOX |
| DNT: | DOWN TCH |
| DNTA: | DOWN TCH ALL |

When system is PHP

| | |
|---|---|
| UPDV: | UP DEVICE |
| DNDV: | DOWN DEVICE |
| UPT: | UP TCH |
| UPTA: | UP TCH ALL |
| DNT: | DOWN TCH |
| DNTA: | DOWN TCH ALL |
| UPVX: | UP VOX |
| DNVX: | DOWN VOX |
| UPSYNC: | UP SYNC |
| DNSYNC: | DOWN SYNC |

When system is NADC

| | |
|---|---|
| DEV: | DEVICE |
| UPT: | UP TCH |
| UPTA: | UP TCH ALL |
| DNT: | DOWN TCH |
| DNTA: | DOWN TCH ALL |

When system is TFTS

| | |
|---|---|
| DEV: | DEVICE |
| UPT: | UP TCH |
| UPTA: | UP TCH ALL |
| DNT: | DOWN TCH |
| DNTA: | DOWN TCH ALL |

■ Suffix code None

■ Initial setting UPDV (When system is PHP), DEV (When system is PDC, NADC)

■ Example PAT␣UPT

## PAT Pattern

■ Function Sets the internal modulation data pattern when the burst function turns off.

| Header | Program command | Query | Response |
|---|---|---|---|
| PAT | PAT␣a | PAT? | PAT␣a |

■ Value of a ØØØØ to 1111 (optional 4 bits), PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example PAT␣PN15

---

## PAT Pattern in "Memory"

■ Function Chooses the burst internal modulation data from 100 patterns in the burst pattern memory.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| PAT | PAT␣MEMa | PAT? | PAT␣MEMa |

■ Value of a ØØ to 99

■ Suffix code None

■ Example PAT␣MEM3

## PN Pseudo random

■ Function

Sets the PN data of DEVICE slot.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| PN | PN␣a | PN? | PN␣a |

■ Value of a PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example PN␣PN15

---

## PSID PS Identification Code

■ Function

Sets the PS-ID data of SYNC slot in the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| PSID | PSID␣a | PSID? | PSID␣a |

■ Value of a #H0000000 to #HFFFFFFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #H0000001

■ Example PSID␣#H0000003

## S Sync Word

■ Function

Sets S data for the TCH slot of TFTS system when the burst function unit is installed.

| Header | Program command | Query | Response |
|---|---|---|---|
| S | S␣a | S? | S␣a |

■ Value of a #H000 to #H7FF (Hexadecimal number)

■ Suffix code None

■ Initial setting #H414

■ Example SYNC␣#H7FF

---

## SA SACCH Slow Associated Control Channel

■ Function

Sets the SA data of VOX/TCH slot in the PHP system.
(When the burst function unit is supported,this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SA | SA␣a | SA? | SA␣a |

■ Value of a #H0000 to #HFFFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #H8000

■ Example SA␣#HFFFF

## SACCH Slow Associated Control Channel

■ Function

Sets the SACCH data of UP TCH/DOWN TCH slot in the PDC/PDC_H/NADC system and VOX slot in the PDC system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SACCH | SACCH␣a | SACCH? | SACCH␣a |

■ Value of a

When system is PDC/PDC_H

| Slot | Range of data |
|---|---|
| VOX, UP TCH | #H0000 to 7FFF |
| DOWN TCH | #H000000 to 1FFFFF |

When system is NADC

#H000 to #HFFF

■ Suffix code

None

■ Initial setting

Depends on the system and slot.

When system is PDC/PDC_H

| Slot | Initial data |
|---|---|
| VOX | #H0000 |
| UP TCH | #H0000 |
| DOWN TCH | #H000000 |

When system is NADC

#H000

■ Example

SACCH␣#H7AAA

## SAD Symbol Adjust

■ Function Changes the synchronous state of symbol clock.

| Header | Program command | Query | Response |
|---|---|---|---|
| SAD | SAD | ——— | ——— |

■ Suffix code None

■ Example SAD

---

## SCBL Scramble On/Off, CS-ID Scramble On/Off

■ Function Turns on or off the scramble function of VOX/UP TCH/DOWN TCH slot in the PDC/PDC_H. Sets On/Off for the CS-ID scramble function of the VOX/TCH slot and the scramble function of the SYNC slot of the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SCBL | SCBL␣a | SCBL? | SCBL␣a |

■ Value of a ON: On
OFF: Off

■ Suffix code None

■ Initial setting ON

■ Example SCBL␣OFF

## SCBLC Scramble Code, CS-ID Scramble Code

■ Function

Sets the scramble code of VOX/UP TCH/DOWN TCH slot in the PDC/PDC_H.
Sets On/Off for the CS-ID scramble function of the VOX/TCH slot and the scramble function of the SYNC slot of the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SCBLC | SCBLC␣a | SCBLC? | SCBLC␣a |

■ Value of a

PDC/PDC_H system: #HØØØ to #H1FF (Hexadecimal number)
PHP system: #HØØØ to #H3FF (Hexadecimal number)

■ Suffix code

None

■ Initial setting

PDC/PDC_H system: #HØØØ
PHP system: #H2ØØ

■ Example

PDC system: SCBLC␣#H1FF
PHP system: SCBLC␣#H3FF

---

## SCRT Secret Scramble On/Off

■ Function

Turns on or off the Secret (Encryption) scramble function of VOX/TCH slot in the PHP.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SCRT | SCRT␣a | SCRT? | SCRT␣a |

■ Value of a

ON: On
OFF: Off

■ Suffix code

None

■ Initial setting

ON

■ Example

SCRT␣OFF

## SCRTC Secret Scramble Code

■ Function

Sets the Secret Scramble (Encryption Key) code VOX/TCH slot in the PHP system. (When the burst function unit is supported,this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SCRTC | SCRTC␣a | SCRTC? | SCRTC␣a |

■ Value of a #H0000 to #HFFFF (Hexadecimal number)

■ Suffix code None

■ Initial setting #H0000

■ Example SCRTC␣#HFFFF

## SLOT Slot

■ Function

Modfies the slot contents of the internal modulation data.
(When the burst function unit is supported,this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SLOT | SLOT␣a | SLOT? | SLOT␣a |

■ Value of a

PDC/PDC_H system

DEVICE:
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH:
- UP TCH — SLOT␣UPT
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

UP TCH ALL:
- UP TCH — SLOT␣UPT
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

UP VOX:
- UP TCH — SLOT␣UPT
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

DOWN TCH:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN TCH ALL:
- On — SLOT␣ON
- Off — SLOT␣OFF

PHP system

UP DEVICE
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN DEVICE
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH:
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH ALL:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN TCH:
- DOWN TCH — SLOT␣DNT
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

DOWN TCH ALL:
- DOWN TCH — SLOT␣DNT
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

■ Value of a (cont.)

UP VOX:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN VOX:
- DOWN TCH — SLOT␣DNT
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

UP SYNC:
- UP TCH — SLOT␣UPT
- UP SYNC — SLOT␣UPSYNC
- Off — SLOT␣OFF

DOWN SYNC:
- DOWN TCH — SLOT␣DNT
- DOWN SYNC — SLOT␣DNSYNC
- VOX — SLOT␣VOX
- Off — SLOT␣OFF

NADC system

DEVICE:
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH:
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH ALL:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN TCH:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN TCH ALL:
- On — SLOT␣ON
- Off — SLOT␣OFF

TFTS system

DEVICE:
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH:
- On — SLOT␣ON
- Off — SLOT␣OFF

UP TCH ALL:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN TCH:
- On — SLOT␣ON
- Off — SLOT␣OFF

DOWN TCH ALL:
- On — SLOT␣ON
- Off — SLOT␣OFF

■ Suffix code — None

■ Example — SLOT␣OFF

## SLOTNO Slot Number

■ Function

Selects the slot number in the pattern.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SLOTNO | SLOTNO␣a | SLOTNO? | SLOTNO␣a |

■ Value of a

The slot number range depends on the system.

| System | Range of slot number |
|---|---|
| PDC | Ø to 2 |
| PDC_H | Ø to 5 |
| PHP | 1 to 4 |
| NADC | Ø to 2 |
| TFTS | Ø to 16 |

■ Suffix code

None

■ Initial setting

1 for the PHP system, and 0 for other systems

■ Example

SLOTNO␣1

---

## SW Sync Word

■ Function

Sets the SW data of VOX/UP TCH/DOWN TCH in the PDC/PDC_H.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SW | SW␣a | SW? | SW␣a |

■ Value of a

#HØØØØØ to #HFFFFF (Hexadecimal number)

■ Suffix code

None

■ Initial setting

| PDC system | Uplink | Downlink |
|---|---|---|
| Slot Ø | #H785B4 | #H87A4B |
| Slot 1 | #H62DC9 | #H9D236 |
| Slot 2 | #H7E28A | #H81D75 |

| PDC_H system | Uplink | Downlink |
|---|---|---|
| Slot Ø | #H785B4 | #H87A4B |
| Slot 1 | #H62DC9 | #H9D236 |
| Slot 2 | #H7E28A | #H81D75 |
| Slot 3 | #H56B15 | #HA94EA |
| Slot 4 | #HAE9B3 | #H5164C |
| Slot 5 | #HB2621 | #H4D9DE |

■ Example

SW␣#HFFFFF

## SYNC Sync Word

■ Function — Sets the SYNC data of UP TCH/DOWN TCH in the NADC.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| SYNC | SYNC␣a | SYNC? | SYNC␣a |

■ Value of a — #HØØØØØØØ to #HFFFFFFF (Hexadecimal number)

■ Suffix code — None

■ Initial setting — Slot Ø #HA91DE4A
Slot 1 #HA9D127A
Slot 2 #HC7E3COC

■ Example — SYNC␣#HFFFFFFF

---

## SYS System

■ Function — Selects the communication systems.

| Header | Program command | Query | Response |
|---|---|---|---|
| SYS | SYS␣a | SYS? | SYS␣a |

■ Value of a — PDC, PDC_H, PHP, NADC, TFTS

■ Suffix code — None

■ Initial setting — PDC

■ Example — SYS␣PHP

## TCH Traffic Channel

■ Function

Sets the TCH data of UP TCH/DOWN TCH slot in the PDC system and TCH slot in the PHP/PDC_H system.
(When the burst function unit is supported,this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| TCH | TCH␣a | TCH? | TCH␣a |

■ Value of a PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example TCH␣PN15

---

## TGS Burst Trigger Select

■ Function

Selects the timing of the burst trigger in the PHP sytem.
(When the burst function unit is supported,this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| TGS | TGS␣a | TGS? | TGS␣a |

■ Value of a UP: Uplink
DN: Downlink

■ Suffix code None

■ Initial setting DN

■ Example TGS␣DN

## UW Unique Word

■ Function

Sets the UW data of VOX/TCH/SYNC slot in the PHP sytem.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| UW | UW␣a | UW? | UW␣a |

■ Value of a

VOX/TCH slot: #H0000 to #HFFFF (Hexadecimal number)
SYNC slot: #H00000000 to #HFFFFFFFF (Hexadecimal number)

■ Suffix code

None

■ Initial setting

VOX/TCH slot: Uplink: #HE149
Downlink: #H3D4C
SYNC slot: Uplink: #H6B899AF0
Downlink: #H50EF2993

■ Example

UW␣#HFFFF

## VOX Voice Operated Transmission

■ Function

Sets the VOX data of VOX slot in the PHP system.
(When the burst function unit is supported, this function is available)

| Header | Program command | Query | Response |
|---|---|---|---|
| VOX | VOX␣a | VOX? | VOX␣a |

■ Value of a PN9, PN15

■ Suffix code None

■ Initial setting PN9

■ Example VOX␣PN15

# 4. SAMPLE PROGRAMS

This section describes some sample programs with the common commands and the program commands, queries, and response messages specific to the MG0301C.

## 4.1 Generating π/4DQPSK Modulation Signal

< Example 1 > Sets the frequency to 1.5 GHz, output level to 0 dBm and communication system to NADC.

```
10  '------------------------------
20  ' MG3670B GPIB SAMPLE PROGRAM
30  ' OUTPUT π/4 DQPSK MODULATION
40  '------------------------------
50  ISET IFC ..... Initializes the interface function
60  ISET REN ..... Sets remote enable to TRUE
70  CMD DELIM=0 ..... Selects CR + LF as the delimiter
80  LET DSG=1 ..... Assigns MG3670 series • MG3660A address to variable DSG
90  PRINT @DSG;"PRE" ..... Initializes MG3670 series • MG3660A
100 SRQ ON ..... Permits the receipt of SRQ
110 PRINT @DSG;"*CLS" ..... Clears Status Byte Register
120 PRINT @DSG;"*SRE 4" ..... Masks bits other than SRE bit 2
130 PRINT @DSG;"ESE2 4" ..... Masks bits other than ESE2 bit 2
140 PRINT @DSG;"MOD ON" ..... Turns modulation on
150 PRINT @DSG;"MODE INT" ..... Sets the I,Q signals source to internal input
160 PRINT @DSG;"SYS NADC" ..... Sets the communication system to NADC
170 PRINT @DSG;"BST ON" ..... Turns the burst function on
180 PRINT @DSG;"PAT UPT" ..... Sets the standard internal modulation data to UP TCH
190 PRINT @DSG;"FREQ 1.5GHZ" ..... Sets the frequency to 1.5 GHz
200 PRINT @DSG;"OLVL 0DBM" ..... Sets the output Level to 0 dBm
210 POLL DSG,N ..... Performs serial polling
220 IF N<>68 THEN GOTO 210 ..... Exit from loop when STB ESB (bit 2) is 1
230 END
```

Lines 140 and 150 turn the modulation on and sets the I,Q signals source to internal input.
Lines 160 to 180 set the communication system to NADC, turns the burst function on,and sets the standard internal modulation data to Uplink traffic channel.
Lines 190 and 200 set the frequency and output level.
Lines 210 and 220 check that setting parameter has completed.

## 4.2 Setting the Internal Modulation Data

<Example 2> Sets the internal modulation data in the PDC system.

```
10  '------------------------------
20  ' MG3670B GPIB SAMPLE PROGRAM
30  ' PATTERN EDIT (PDC)
40  '------------------------------
50  ISET IFC
60  ISET REN
70  CMD DELIM=0
80  LET DSG=1
90  PRINT @DSG;"PRE"
140 PRINT @DSG;"MOD ON"
150 PRINT @DSG;"MODE INT"
160 PRINT @DSG;"SYS PDC" ..... Sets the communication system to PDC
170 PRINT @DSG;"BST ON" ..... Turns the burst function on
180 PRINT @DSG;"PAT UPT" ..... Sets the standard internal modulation data to UP TCH
190 PRINT @DSG;"SLOTNO 1" ..... Sets the slot number to 1
200 PRINT @DSG;"SLOT UPT" ..... Sets the slot 1 to UP TCH
210 PRINT @DSG;"TCH PN15" ..... Sets the TCH data of slot 1 to PN15
220 PRINT @DSG;"CC #HFF" ..... Sets the CC data of slot 1 to FF (Hexadecimal number)
230 END
```

Lines 160 to 180 set the communication system to PDC, turns burst function on, and sets the standard internal modulation data to UP TCH.

Line 190 sets the slot number to 1.
Line 200 sets the slot 1 to UPTCH.
Lines 210 and 220 set the TCH data of slot 1 to PN15, and the CC data of slot 1 to FF(Hexadecimal number).

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# MG0301C

# π/4 DQPSK Modulation Unit

# Operation Manual

Third Edition

Read this manual after reading the Digital Modulation Signal Generator operation manual first. Keep it handy so that it can be read when necessary.

Measuring Instruments Division
Measurement Group

ANRITSU CORPORATION

Document: M-W0872AE-3.0

## Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.

### Symbols used in manual

| | |
|---|---|
| **WARNING** | This indicates a hazardous procedure that could result in serious injury or death if not performed properly. |
| **CAUTION** | This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken. |

MG0301C $\pi$/4 DQPSK Modulation Unit
Operation Manual

August 1994 (First Edition)
December 1995 (Third Edition)

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Anritsu affix the CE Conformity Marking on the following product (s) accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

## CE Conformity Marking

CE

### 1. Product Name/Model Name

Product Name: Digital Modulation Signal Generator, and Expansion Unit

Model Name: MG3670B, MG3671A, MG3660A, and MG03××□

### 2. Applied Directive

EMC: Council Directive 89/336/EEC

### 3. Applied Standards

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

| | | Performance Criteria* |
|---|---|---|
| IEC801-2 (ESD) | 4 kVCD, 8 kVAD | B |
| IEC801-3 (Rad.) | 3 V/m | A |
| IEC801-4 (EFT) | 1 kV | B |

*: Performance Criteria

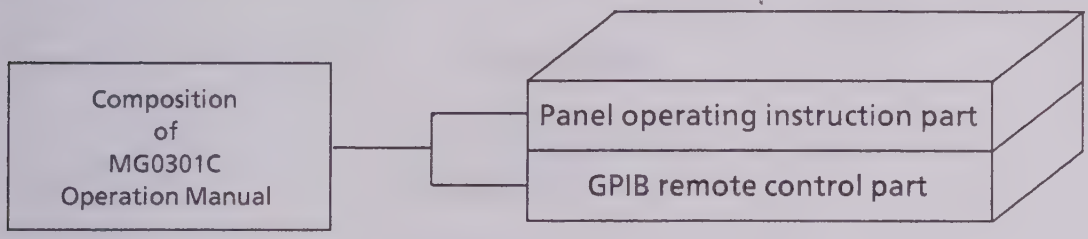
A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

# ABOUT THIS MANUAL

## (1) Composition of MG0301C Operation Manuals

The operation manual of the MG0301C ($\pi$/4 DQPSK Modulation Unit) is composed of the following two parts. The related operations of the MG0303B (Burst Function Unit) are also explained. The term "MG3670 series" mentioned in this operation manual refers to both the MG3670B and the MG3671A. Substitute either name for the term as appropriate. Since operation manuals for the MG3670 series and the MG3660A are available as separate volumes, read them together with this manual.




Panel Operating Instructions part: Provides information on the MG0301C outline, preparation before use, manual (local) operation, measuremant, performance test, storage, transportation, screen transition, communication system, and error message.

GPIB remote control part: Provides information on the MG0301C remote control which conforms with IEEE488.2 standards. To assist creating GPIB programs, this part gives examples of N88 BASIC language programs that run on the NEC Corp. PC9800 series of personal computers.

## (2) The relations between the installed units and the expanded functions

The MG0301C ($\pi$/4 DQPSK Modulation Unit) and the MG0303B (Burst Function Unit) are expansion units, and are inserted in the MG3670 series • MG3660A Digital Modulation Signal Generator.

The relations between the installed units and the expanded functions are explained below:

| Units installed | Modulation system | Modulation pattern | RF output |
|---|---|---|---|
| MG0301C only | $\pi$/4 DQPSK Modulation<br>• Bit rate: 42 kbps, Filter: $\alpha=0.5$<br>• Bit rate: 48.6 kbps, Filter: $\alpha=0.35$<br>• Bit rate: 384 kbps, Filter: $\alpha=0.5$<br>• Bit rate: 44.2kbps, Filter: $\alpha=0.4$ | • PN9/PN15-stage pseudorandom pattern<br>• Free 4-bit repetition pattern | • Continuous wave |
| MG0301C + MG0303B | $\pi$/4 DQPSK Modulation<br>• Bit rate: 42 kbps, Filter: $\alpha=0.5$<br>• Bit rate: 48.6 kbps, Filter: $\alpha=0.35$<br>• Bit rate: 384 kbps, Filter: $\alpha=0.5$<br>• Bit rate: 44.2kbps, Filter: $\alpha=0.4$ | • PN9/PN15-stage pseudorandom pattern<br>• Free 4-bit repetitionpattern<br>• Pattern conforming to the systems | • Continuous wave<br>• Burst wave |

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# MG0301C

# π/4 DQPSK Modulation Unit

# Operation Manual
(Panel Operating Instructions)

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# SECTION 1
# GENERAL

This section outlines the MG0301C $\pi$ / 4 DQPSK Modulation Unit and explains the composition of this manual, the configuration of the MG0301C the standard accessories, with the related unit for expanding the MG0301C capabilities, and the MG0301C and MG0303B specifications.

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# SECTION 1
# GENERAL

## 1.1 Product Outline

The MG0301C $\pi/4$ DQPSK Modulation Unit and the MG0303B Burst Function Unit are expansion units, and are installed in the MG3670 series • MG3660A Digital Modulation Signal Generator to generate the I/Q signals for $\pi/4$ DQPSK modulation.

Installing the MG0301C to the MG3670 series • MG3660A permits modulation signal output conforming to communication systems including Japan's digital cordless telephones (PHP: Personal Handy Phone), Japan's mobile telephones (PDC: Personal Digital Cellular), North-American mobile telephones (NADC: North-American Digital Cellular Systems) and terrestrial flight telephone services (TFTS).

Installing the MG0301C and the MG0303B enables outputting the burst signal based on each the communication-system channel format.

The table lists the model names of digital modulation signal generators (main instruments) capable of housing the MG0301C $\pi/4$ DQPSK Modulation Unit and the MG0303B Burst Function Unit.

| Model | Name | Remarks |
|---|---|---|
| MG3670B | Digital Modulation Signal Generator | MG3670 series |
| MG3671A | Digital Modulation Signal Generator | MG3670 series |
| MG3660A | Digital Modulation Signal Generator | |
| MG3670A† | Digital Modulation Signal Generator | Requires maintenance |

† In order to combine the expansion units with the MG3670A, the MG3670A must be remodeled. Please contact your nearest Anritsu representative.

## 1.2 Composition of Operation Manual

This operation manual is composed of six sections. Each section is outlined below.

| Section composition | Explanation |
|---|---|
| SECTION 1<br>GENERAL | Provides information about product outline, composition of manual, equipment configuration with standard accessories, related unit, and specifications |
| SECTION 2<br>BASIC OPERATION | Provides information about basic operation and auxiliary control signals |
| SECTION 3<br>DETAILED OPERATIONS | Provides information about operating communication systems and trigger function |
| SECTION 4<br>MEASUREMENT | Provides information about typical measurement examples for the digital mobile radio. |
| SECTION 5<br>PERFORMANCE TESTS | Provides information about equipment required for executing MG0301C performance tests, setup, and procedure of performance tests |
| SECTION 6<br>STORAGE AND TRANSPORTATION | Provides information about regular care and long-term storage as well as repacking and transportation |

## 1.3 Equipment Configuration

This paragraph describes the configuration of the MG0301C π/4 DQPSK Modulation Unit and the related unit to expand the function.

### 1.3.1 Standard configuration

The table below shows the configuration of the MG0301C with the standard accessories:

**Table 1-1 Standard Composition**

| Item | Model / Order No. | Name | Qty. | Remarks |
|---|---|---|---|---|
| Main instrument | MG0301C | π/4 DQPSK Modulation Unit | 1 | |
| Accessories | W0872AE | Operation manual | 1 | Involves the description of the MG0303B function related to the MG0301C |

### 1.3.2 Unit

The table below shows the related units for the MG3670 series • MG3660A. (The MG0301C not included)

**Table 1-2 Expansion Units**

**Modulation Units for Communication Systems:**

| Model No. | Name | System to be used |
|---|---|---|
| MG0302A | GMSK Modulation Unit | GSM, PCN, CT2 |
| MG0305A | GFSK Modulation Unit | DECT |
| MG0307A | π/4 DQPSK Modulation Unit | PACS, WCPE, PHP |

**Burst Function Unit:** used with the modulation units for Communication Systems

| Model No. | Name | System to be used |
|---|---|---|
| MG0303B | Burst Function Unit | PDC[†1], PHP, NADC, TFTS, PDC_H[†2], CT2, GSM, PCN, DECT, PACS, WCPE |

[†1] The full rate of Japanese Personal Digital Cellular system is expressed as PDC.

[†2] The half rate of Japanese Personal Digital Cellular system is expressed as PDC_H.

## 1.4 Specifications

The MG0301C and MG0303B specifications are listed in the following table.

### 1.4.1 MG0301C π/4 DQPSK Modulation Unit specifications

The MG0301C π/4 DQPSK Modulation Unit specifications are listed in Table 1-3.

**Table 1-3 MG0301C π/4 DQPSK Modulation Unit Specifications**

| | |
|---|---|
| Applicable system | PDC, PHP, NADC, TFTS, PDC_H |
| Modulation system | π / 4 DQPSK |
| Vector error | I/Q signal: ≦1.5% rms (at 50 Ω output)<br>RF signal: ≦1.8% rms (MG3670B/3671A, at ≦ +5 dBm output)<br>≦2.5% rms (MG3660A, at +5 dBm output) |
| Internal modulation data | Pseudorandom pattern: PN15/PN9<br>[Free 4-bit repetition pattern (ex: 1010, 1111)] |
| External modulation data | Data Clock: Covering ±5% of bit rate<br>Data: Digital data synchronized with Data Clock<br>Symbol Clock: Clock specified by Data synchronized with Data Clock<br>[TTL level, BNC connector, polarity selectable] |
| I/Q signal output | Selectable 50 Ω or CMOS (600 Ω), BNC connector<br>50 Ω setting: 1 Vp-p ±2% (modulation data: 0000)<br>CMOS setting: Variable in 10% steps over the 10% to 100% range of 1 Vp-p<br>±2% (modulation data: 0000)<br>Variable offset voltage: 0 to 4 V (1 mV steps) |
| Adjacent channel leakage power ratio | For PHP system<br>≦ −74 dB: MG3670B/3671A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz<br>≦ −69 dB: MG3660A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz |
| PDC | Carrier frequency range: 300 kHz to 2250 MHz†<br>Bit rate: 42 kbps<br>Baseband filter:<br>Root Nyquist: α=0.5, Nyquist: α=0.5 |
| PHP | Carrier frequency range: 1 to 2250 MHz†<br>Bit rate: 384 kbps<br>Baseband filter:<br>Root Nyquist: α=0.5, Nyquist: α=0.5 |
| NADC | Carrier frequency range: 300 kHz to 2250 MHz†<br>Bit rate: 48.6 kbps<br>Baseband filter:<br>Root Nyquist: α=0.35, Nyquist: α=0.35 |
| TFTS | Carrier frequency range: 300 kHz to 2250 MHz†<br>Bit rate: 44.2 kHz<br>Baseband filter:<br>Root Nyquist: α=0.4, Nyquist: α=0.4 |
| PDC_H | Carrier frequency range: 300 kHz to 2250 MHz†<br>Bit rate: 44.2 kHz<br>Baseband filter:<br>Root Nyquist: α=0.5, Nyquist: α=0.5 |

† The upper limit of carrier frequency conforms to the specification of the MG3670 series • MG3660A.

### 1.4.2 MG0303B Burst Function Unit specifications

Table 1-4 lists the MG0303B Burst Function Unit specifications for (PDC / PHP / NADC / TFTS / PDC_H) when used with the MG0301C.

**Table 1-4 MG0303B Burst Function Unit Specifications (1/2)**

| Applicable communication system | | PDC, PHP, NADC, TFTS, PDC_H (with MG0301C) |
|---|---|---|
| Modulation signal | Internal data mode | TDMA framing specified for each system; modulation in each time slot using any Internal data mode |
| | Internal modulation data | Pseudorandom pattern: PN15/PN9†(for device)<br>Specified pattern based on communication channel format specified for each system:<br>Up/down communication channel, VOX control<br>TCH section consists of pseudorandom pattern (PN15/PN9)† |
| | External data mode | Data Clock: Covering ±5% of bit rate<br>Data: Digital data synchronized with Data Clock<br>Symbol Clock: Clock specified by Data synchronized with Data Clock<br>[TTL level, BNC connector, polarity selectable] |
| Auxiliary signal input | Burst trigger input | Outputs burst wave synchronized with trigger input signal of burst repetition.<br>Input period: burst repetition rate ±1 symbol<br>[TTL level, BNC connector (rear panel), polarity selectable] |
| | Burst gate input | Outputs burst waveform corresponding to input signal width.<br>Input signal width: ≧14 symbols, period: ≧22 symbols<br>[TTL level, BNC connector (rear panel), polarity selectable] |
| Auxiliary signal output | Burst trigger output | Outputs 1-symbol width pulse at same cycle as burst waveform output.<br>[TTL level, BNC connector (rear panel), polarity selectable] |
| | Pattern sync output | Following outputs selectable at internal modulation:<br>PN Clock: Data clock corresponding to pseudorandom pattern part<br>PN Gate: Gate signal corresponding to pseudorandom pattern part<br>RF Gate: Signal for controlling pulse modulator in accordance with burst signal output<br>[TTL level, BNC connector (rear panel) ] |
| | Burst gate output | Outputs gate signal corresponding to burst waveform output at internal modulation.<br>[TTL level, BNC connector (rear panel), polarity selectable] |
| RF output | Burst on/off ratio | ≧80 dB (MG3670B/3671A, +5 dBm output, PDC, NADC, TFTS, PDC_H), ≧75 dB (MG3660A, +5 dBm output, PDC, NADC, TFTS, PDC_H)<br>≧75 dB (+5 dBm output, PHP) |
| | Rise/fall time | Equivalent to 2 symbols |

† Pseudorandom pattern in each has different phase, and its pattern within the TCH segment of slots is continuous.

## Table 1-4 MG0303B Burst Function Unit Specifications (2/2)

| | | |
|---|---|---|
| Memory | Pattern memory | 100 patterns (store and recall of internal modulation pattern data) |
| PDC | Burst repetition period | 20 ms |
| | Slot configuration | For device, up/down communication channel, up VOX control |
| | Output slot select | On/off selectable for any slots of Slot 0 to Slot 2 (excluding all slots off) |
| | Edit function | SW/CC/SACCH: Any data, TCH: PN9/PN15† selectable |
| | Scramble function | TCH+SF+SACCH scramble on/off, any scramble code setting |
| PHP | Burst repetition period | 5 ms |
| | Slot configuration | For device, up/down communication channel, VOX control |
| | Output slot select | On/off selectable for any slots of Slot 0 to Slot 2 (excluding all slots off) |
| | Edit function | SYNC/SACCH/CDVCC: Any data, DATA: PN9/PN15† selectable |
| | Scramble function | TCH+CRC, scramble and secret scramble on/off, any scramble code setting |
| | Adjacent channel leakage power ratio | ≦−74 dB: MG3670B/3671A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz<br>≦−69 dB: MG3660A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz |
| NADC | Burst repetition period | 20 ms |
| | Slot configuration | For device, up/down communication channel |
| | Output slot select | On/off selectable for any slots of Slot 0 to Slot 2 (excluding all slots off) |
| | Edit function | SYNC/SACCH/CDVCC: Any data, DATA: PN9/PN15† selectable |
| TFTS | Burst repetition period | 80 ms |
| | Slot configuration | For device, up/down communication channel |
| | Output slot select | On/off selectable for any slots of Slot 0 to Slot 15 (excluding all slots off) |
| | Edit function | S: Any data, DATA: PN9/PN15† selectable |
| PDC_H | Burst repetition period | 40 ms |
| | Slot configuration | For device, up/down communication channel, up VOX control |
| | Output slot select | On/off selectable for any slots of Slot 0 to Slot 5 (excluding all slots off) |
| | Edit function | SW/CC/SACCH: Any data, TCH: PN9/PN15† selectable |
| | Scramble function | TCH+SF+SACCH scramble on/off, any scramble code setting |

† Pseudorandom pattern in each has different phase, and its pattern within the TCH segment of slots is continuous.

# SECTION 2
# BASIC OPERATION

This section describes basic operation procedures for the MG0301C $\pi/4$ DQPSK Modulation Unit and the MG0303B Burst Function Unit and their auxiliary signals. See Section 3 on how to use the modulation patterns and trigger signals for each system.

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2.9 Phase Encode Function ..... 2-26

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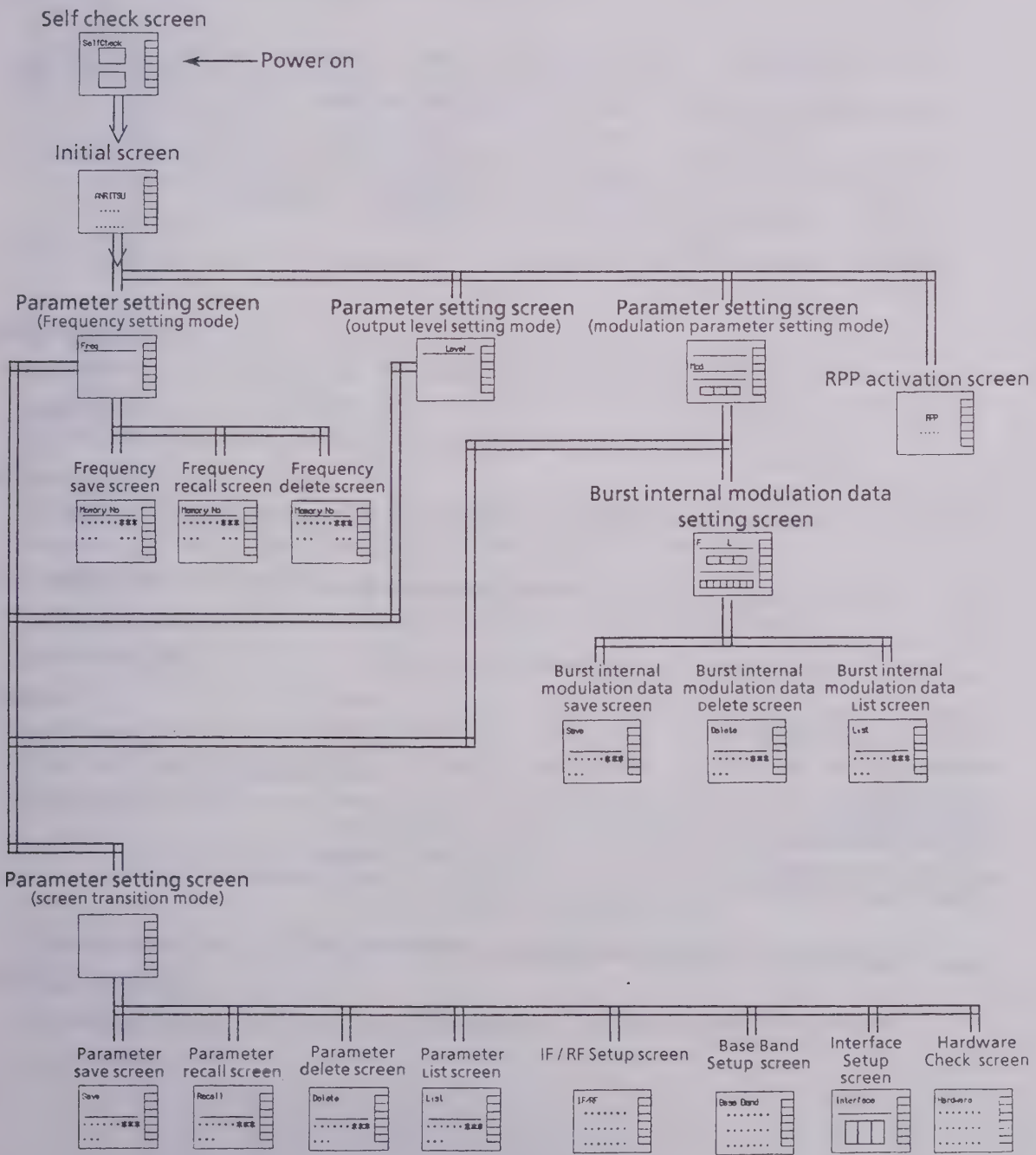
# SECTION 2
# BASIC OPERATION

## 2.1 Screen Transition

The display screen switches as shown below.

The screens appearing in this chapter are those for the MG3670B. The screens for the MG3671A/ MG3660A differ only in the model name indication in the top of the screen. Substitute the applicable model name for the model name in the screens.



## 2.2 Setting the Modulation Parameters

### (1) Screen

When the Main Function section Mod key on the front panel is pressed, the parameter setting screen (modulation parameter setting mode) appears.

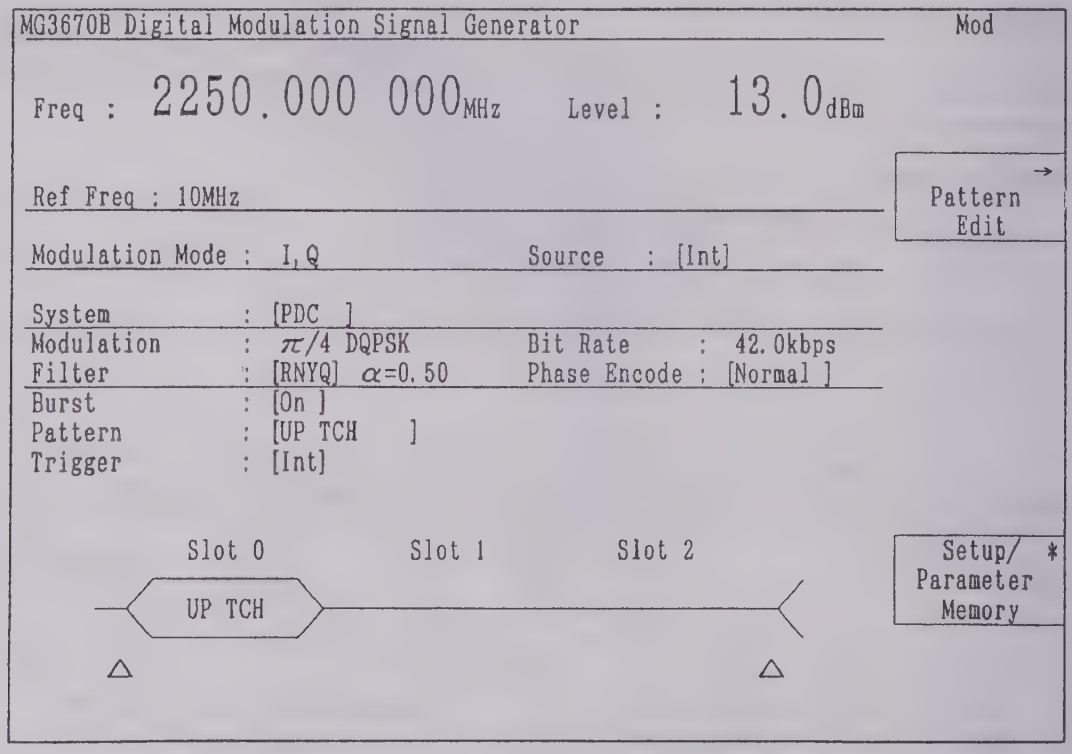



**Fig. 2-1 Parameter Setting Screen (modulation parameter setting mode)**

Use the Cursor keys to set the following parameters in this screen.

- I, Q signal input ..... Source
- Communication system ..... System
- Baseband filter ..... Filter
- Phase Encode ..... Phase Encode
- Burst function ..... Burst
- Internal modulation data ..... Pattern
- Burst trigger input ..... Trigger
- Burst trigger position ..... Trigger Select

***Note:*** *Trigger Select can be set when the communication system is PHP.*

## (2) Setting parameters

### ■ Source (Int / Ext)

Sets the I, Q signals to internal (Int) or external (Ext).

Initial setting: Int

### ■ System

Select one of the five communication systems; PDC, PHP, NADC, TFTS and PDC_H. When the communication system is selected, the modulation method, roll-off rate (a), and bit rate are set as shown below.

Initial setting: PDC (does not affect the Preset key)

| Communication system | Modulation method | Roll-off rate | Bit rate |
|---|---|---|---|
| PDC | $\pi$ / 4 DQPSK | $\alpha = 0.5$ | 42 kbps |
| PHP | $\pi$ / 4 DQPSK | $\alpha = 0.5$ | 384 kbps |
| NADC | $\pi$ / 4 DQPSK | $\alpha = 0.35$ | 48.6 kbps |
| TFTS | $\pi$ / 4 DQPSK | $\alpha = 0.4$ | 44.2 kbps |
| PDC_H | $\pi$ / 4 DQPSK | $\alpha = 0.5$ | 42.0 kbps |

### ■ Filter (NYQ / RNYQ)

Nyquist (NYQ) or Root-Nyquist (RNYQ) can be selected as the baseband filter.

Initial setting: Root-Nyquist (RNYQ)
The roll-off rate ($\alpha$) is fixed according to the communication system.

### ■ Phase Encode (Normal / Inverse)

Normally use the normal mode. Selecting the inverse mode inverts the right and left of modulation wave spectrum from the carrier frequency. For detail, refer to Paragraph 2.9.

### ■ Burst (On / Off)

The burst function can set to On when a burst function unit (MG0303B) is installed.

Initial setting: Off

### ■ Pattern

The following internal modulation data can be set:
When data of BaseBand Setup screen is externally input, Pattern is not displayed.

- When the burst function is on: Standard internal modulation data of each communication system (For details on the internal modulation data of each communication system, see Section 3.)
  Data stored in the internal modulation data memory (For details, see 2.4 Internal modulation data memory)
- When burst function is off: PN9, PN15 and any 4-bit data (0000 to 1111)

### ■ Trigger (Int / Ext)

Sets the burst trigger to either internal (Int) or external (Ext) when the burst function is on.

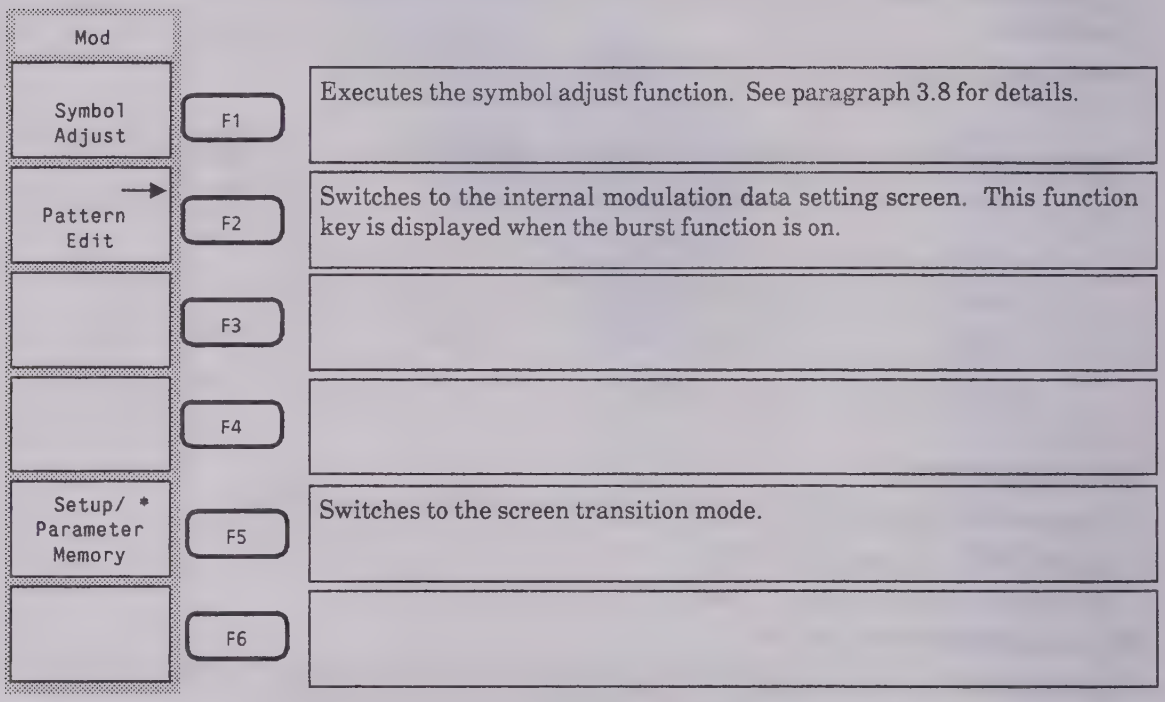
Initial setting: Int

■ **Trigger Select (Uplink / Downlink)**

Sets the burst trigger position of the PHP system to either Uplink or Downlink when the burst function is on.

Initial setting:Downlink

## (3) Function keys



## 2.3 Setting Internal Modulation Data

### (1) Screen

The internal modulation data setting screen is displayed when the 'Pattern Edit' F2 soft key shown in the parameter setting screen (modulation parameter setting mode) is pressed while the burst function is on.

The standard internal modulation data set in Pattern in the modulation parameter setting screen is displayed in this screen.

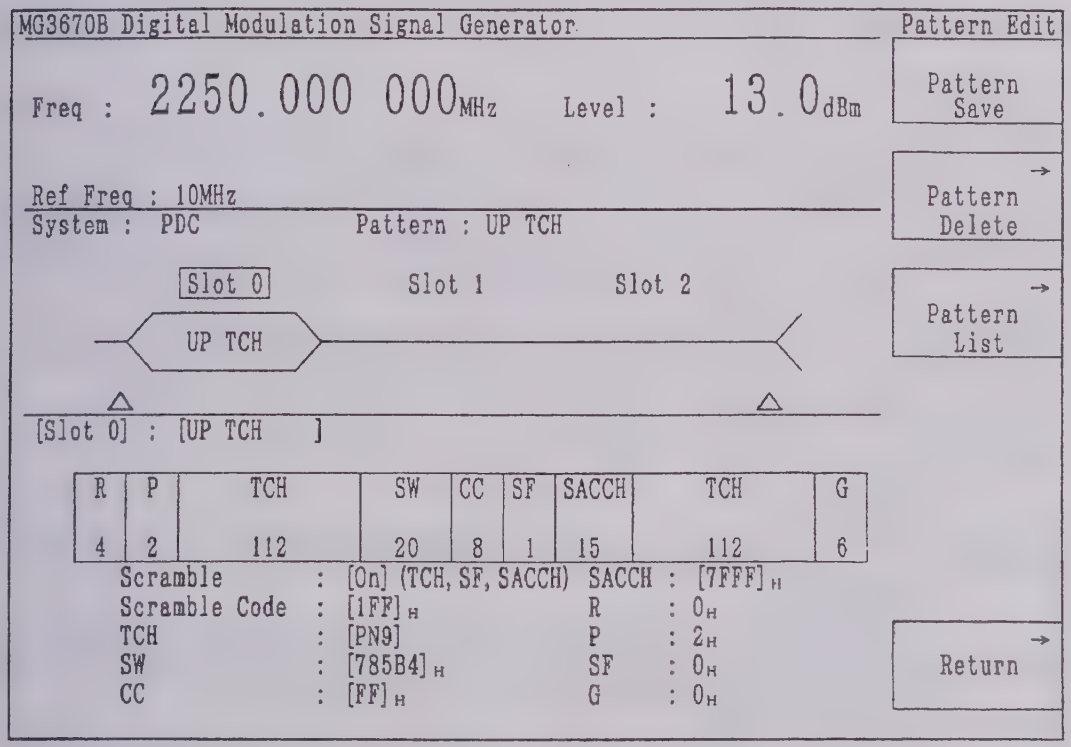



**Fig. 2-2 Internal Modulation Data Setting Screen (PDC system)**

***Note:*** *The internal modulation data cannot be set if there is no burst function unit (MG0303B) installed.*

### (2) Set parameters

■ Slot number

Selects the numbers of the desired slots.

PDC: Slot 0 to Slot 2
PHP: Slot 1 to Slot 4
NADC: Slot 0 to Slot 2
TFTS: Slot 0 to Slot 16
PDC_H: Slot 0 to Slot 5

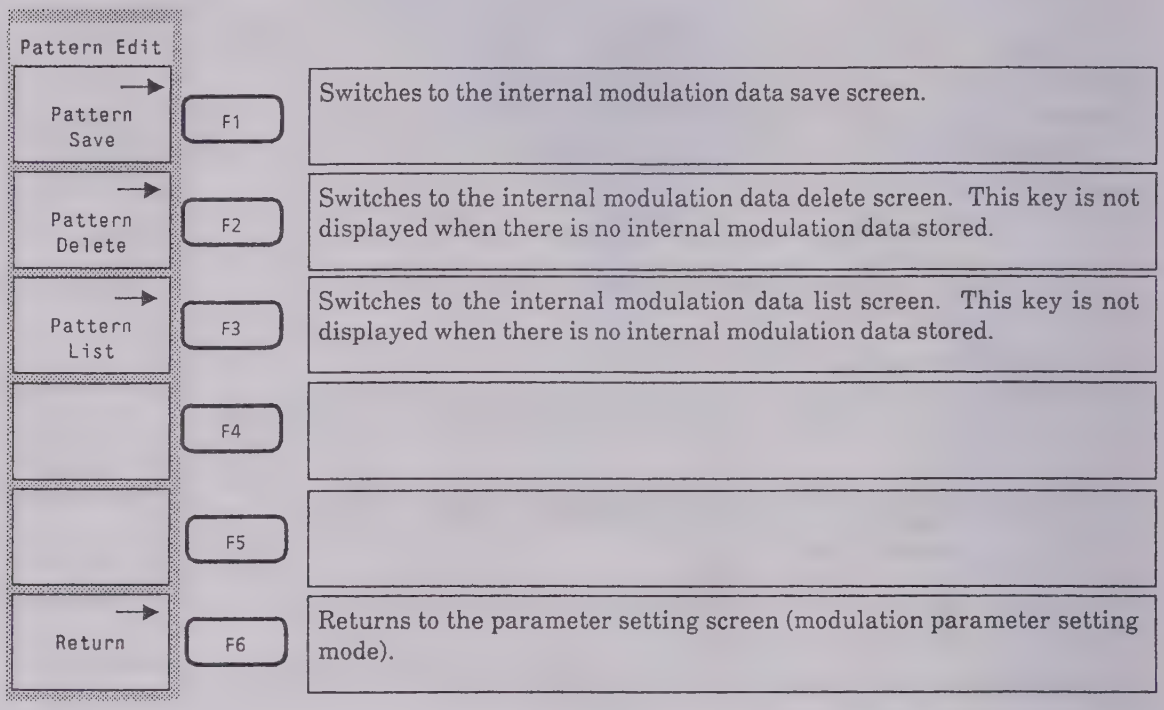
■ Slot

Selects the applicable slot. The selectable slot depends on the standard internal modulation data set in Pattern of each communication system. For details on the internal modulation data of each communication system, see Section 3.

■ Modulation data

Sets the modulation data of a slot. The selectable types and ranges of modulation data differ from slot to slot. For details on the internal modulation data of each communication system, see Section 3.

## (3) Function keys


Pattern Edit
Pattern Save
F1
Switches to the internal modulation data save screen.
Pattern Delete
F2
Switches to the internal modulation data delete screen. This key is not displayed when there is no internal modulation data stored.
Pattern List
F3
Switches to the internal modulation data list screen. This key is not displayed when there is no internal modulation data stored.
F4
F5
Return
F6
Returns to the parameter setting screen (modulation parameter setting mode).

## 2.4 Internal Modulation Data Memory

Modulation data set in the internal modulation data setting screen can be stored into, retrieved, deleted and listed from memory. Each of the memory operations are discussed in detail below.

### 2.4.1 Saving internal modulation data

When the 'Pattern Save' F1 soft key is pressed in the internal modulation data setting screen, the internal modulation data save screen appears. Specify the memory location number using the data keys, rotary knob, Step keys or Cursor keys and press the Set or Enter key to store the set data.

Memory location number range: 0 to 99

#### (1) Screen

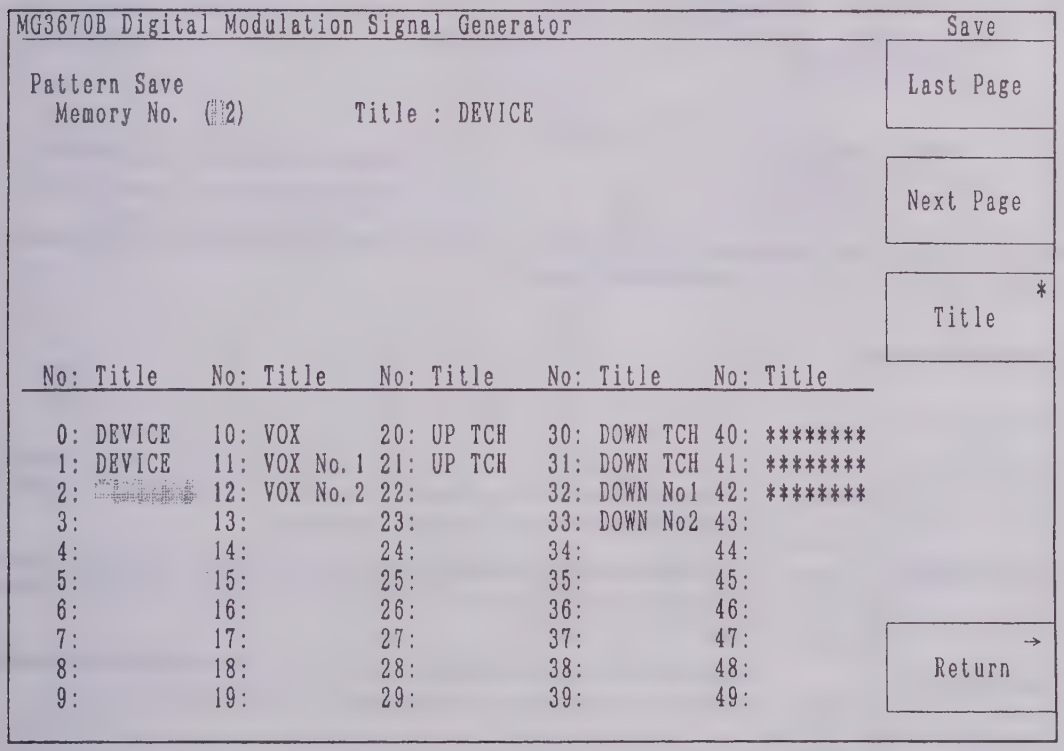



Fig. 2-3 Internal Modulation Data Save Screen

Initial memory location number: Currently available location having the smallest number

If data is already stored in the specified location, a Yes/No window appears for confirmation purposes. Press the Set key to overwrite the current data. After storing the data, the internal modulation data setting screen is redisplayed.

**Example:** Stores modulation data in memory location 10.

| Step | Action | Verification |
|---|---|---|
| 1 | Mod† | Sets the modulation parameter setting mode and lights the Mod key's LED indicator. |
| 2 | Pattern Edit + F3 | Displays the internal modulation data setting screen. |
| 3 | Pattern Save + F1 | Displays the internal modulation data saving screen. |
| 4 | 1 0 Set | Specifies memory location 10 and stores internal modulation data in that location. |

† There is no need to press the Mod key if its indicator is already lit.

## (3) Function keys

| | | |
|---|---|---|
| Save | | |
| Last Page | F1 | Displays the previous page of the current data list. No operation is performed when there is no previous page. |
| Next Page | F2 | Displays the next page of the current data list. Nothing is done when there is no next page. |
| Title * | F3 | Displays the title input window and related function keys. |
| | F4 | |
| | F5 | |
| Return → | F6 | Returns to the internal modulation data setting screen. |

## ■ Inputting a title

A title up to eight characters long can be entered when storing internal modulation data. "********" is displayed in the title field when no title is specified.

### (1) Screen

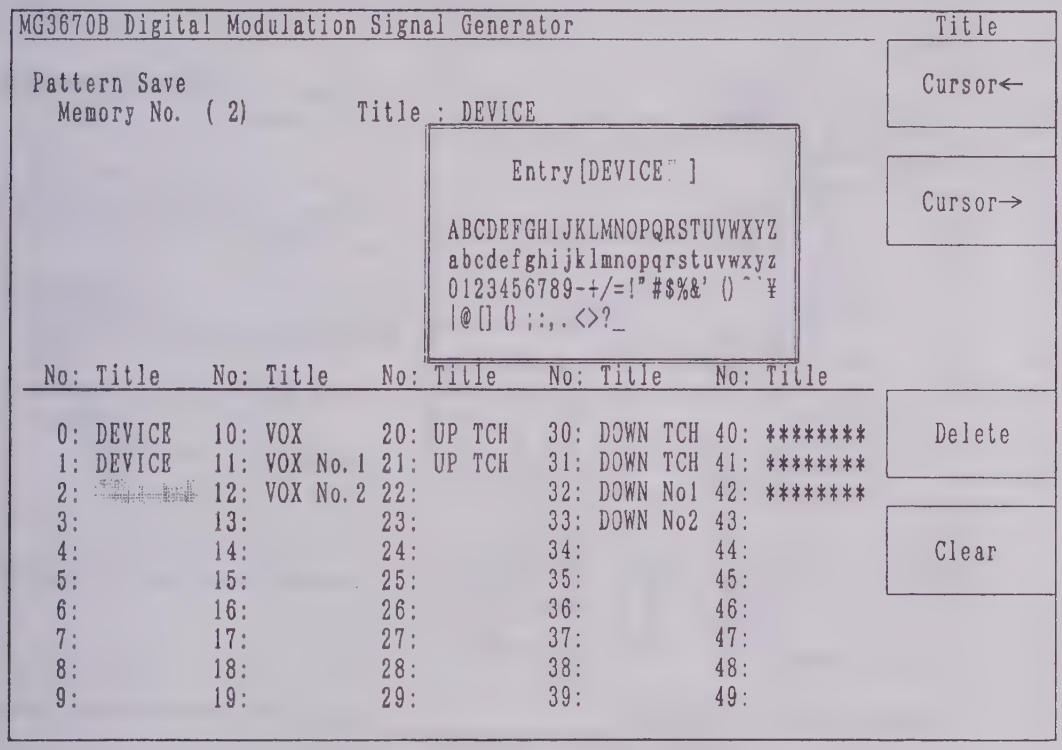
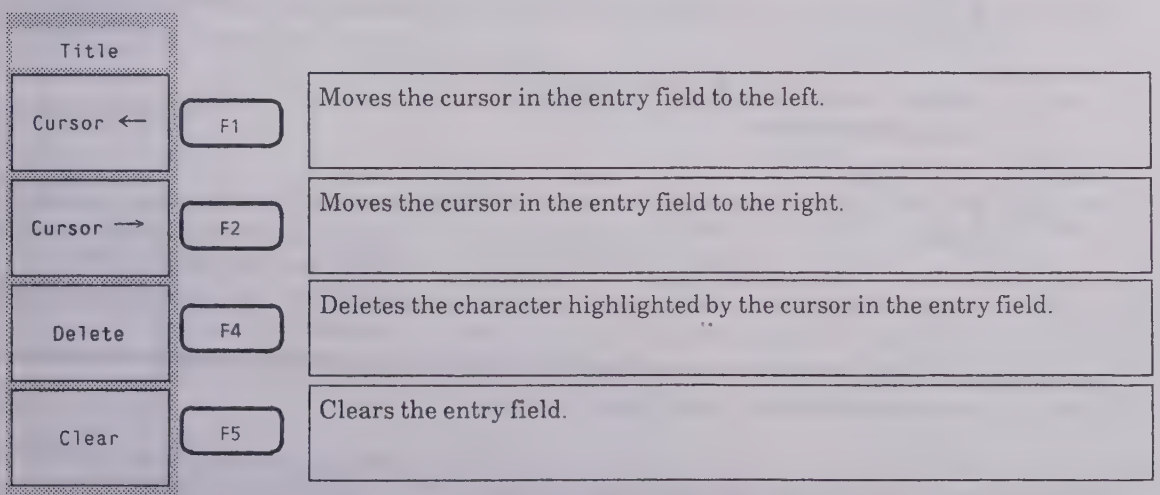

MG3670B Digital Modulation Signal Generator
Title
Pattern Save
Memory No. ( 2)
Title : DEVICE
Entry[DEVICE ]
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
0123456789-+/=!"#$%&' () ^ ` ¥
|@[] {} ;:,.<>?_
Cursor←
Cursor→
Delete
Clear
No: Title No: Title No: Title No: Title No: Title
0: DEVICE 10: VOX 20: UP TCH 30: DOWN TCH 40: ********
1: DEVICE 11: VOX No.1 21: UP TCH 31: DOWN TCH 41: ********
2: 12: VOX No.2 22: 32: DOWN No1 42: ********
3: 13: 23: 33: DOWN No2 43:
4: 14: 24: 34: 44:
5: 15: 25: 35: 45:
6: 16: 26: 36: 46:
7: 17: 27: 37: 47:
8: 18: 28: 38: 48:
9: 19: 29: 39: 49:

Fig. 2-4 Internal modulation data save screen (title input window)

### (2) Function keys



**Example :** Inputs the title 'Anritsu'.

| Step | Action | Verification |
|---|---|---|
| 1 | Mod † | Switches to modulation parameter setting mode and lights the Mod key's LED indicator. |
| 2 | Pattern Edit F2 | Switches to the internal modulation data setting screen. |
| 3 | Pattern Save F1 | Switches to the internal modulation data save screen. |
| 4 | Title F3 | Opens the window for setting the title. |
| 5 | Clear F5 | Clears the title entry field. |
| 6 | Cursor ← F1, Cursor → F2 | Moves the cursor within the entry field. |
| 7 | Cursor keys or rotary knob | Selects the characters from the character list. |
| 8 | Enter | Enters the selected character in the Entry field. |
| 9 | BS | Deletes an erroneously entered character. |
| 10 | Repeat steps 6, 7 and 8 until 'Anritsu' is completely entered. | |
| 11 | Set | Closes the title input window after inputting the title. (After inputting the title, specify the memory location number where internal modulation data will be stored.) |

† There is no need to press the Mod key if its LED indicator is already on.

***Note:*** *The title can also be entered using the data keys.*

## 2.4.2 Recalling internal modulation data

Data saved in the internal modulation data save screen can be retrieved through the Pattern setting in the parameter setting screen (modulation parameter setting mode).

### (1) Screen

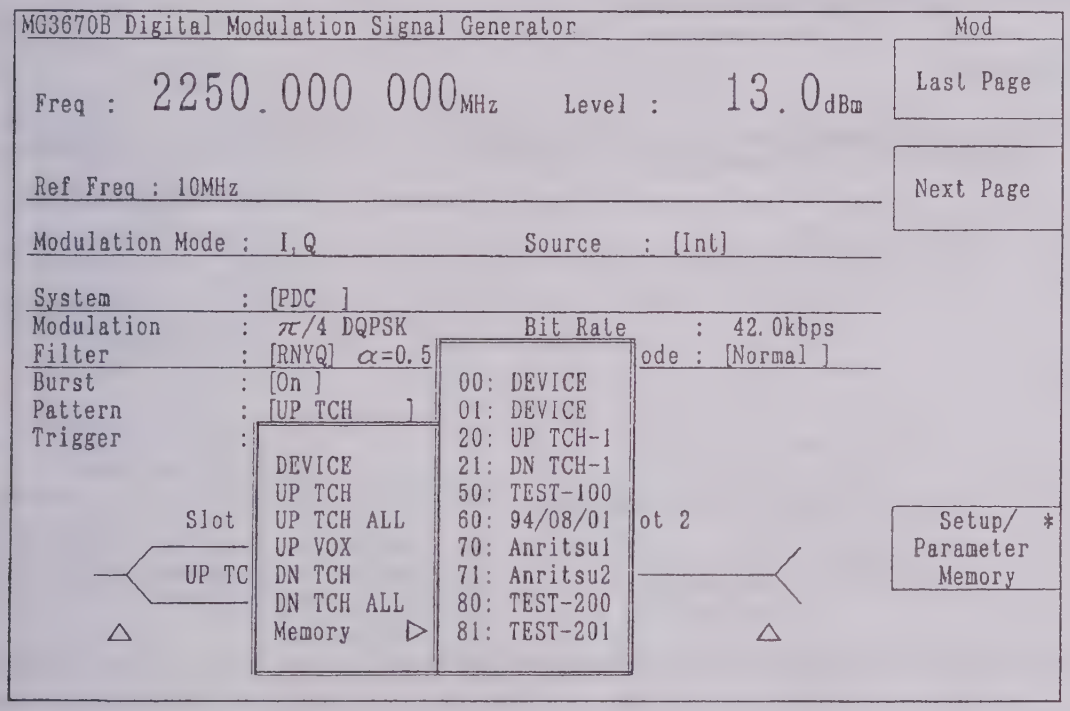
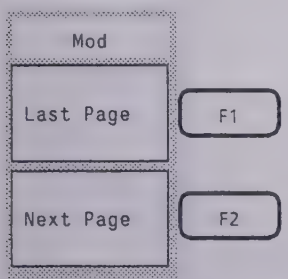



**Fig. 2-5 Parameter Setting Screen (modulation parameter setting mode, Pattern setting window)**

If internal modulation data is stored in memory, 'Memory▷' is displayed in the Pattern setting window in the parameter setting screen (modulation parameter setting mode). When this is selected, a sub-window opens and data stored in memory are displayed.

When the Set key is pressed and the pattern selected, both windows close simultaneously. Press the Cancel key to close the sub-window only.

### (2) Function keys




| | |
|---|---|
| Last Page (F1) | Displays the previous page in the sub-window. No operation is performed when there is no previous page. |
| Next Page (F2) | Displays the next page in the sub-window. No operation is performed when there is no previous page. |

***CAUTION:*** *When the communication system is PDC_H (half rate), the pattern saved at PDC (full rate) can be recalled. In this case, contents of full rate slots 0 to 2 are reflected to slots 0 to 2 and slots 3 to 5 are set to off.*

### 2.4.3 Deleting internal modulation data

When the 'Pattern Delete' F2 soft key is pressed in the internal modulation data setting screen, the internal modulation data delete screen appears. Use the data keys, rotary knob, Step keys and Cursor keys to specify the memory number and then press the Set and Enter keys. A Yes/No window then appears for verification. Select Yes to delete the data.

Initial memory location number: Currently saved memory location having the smallest number

#### (1) Screen

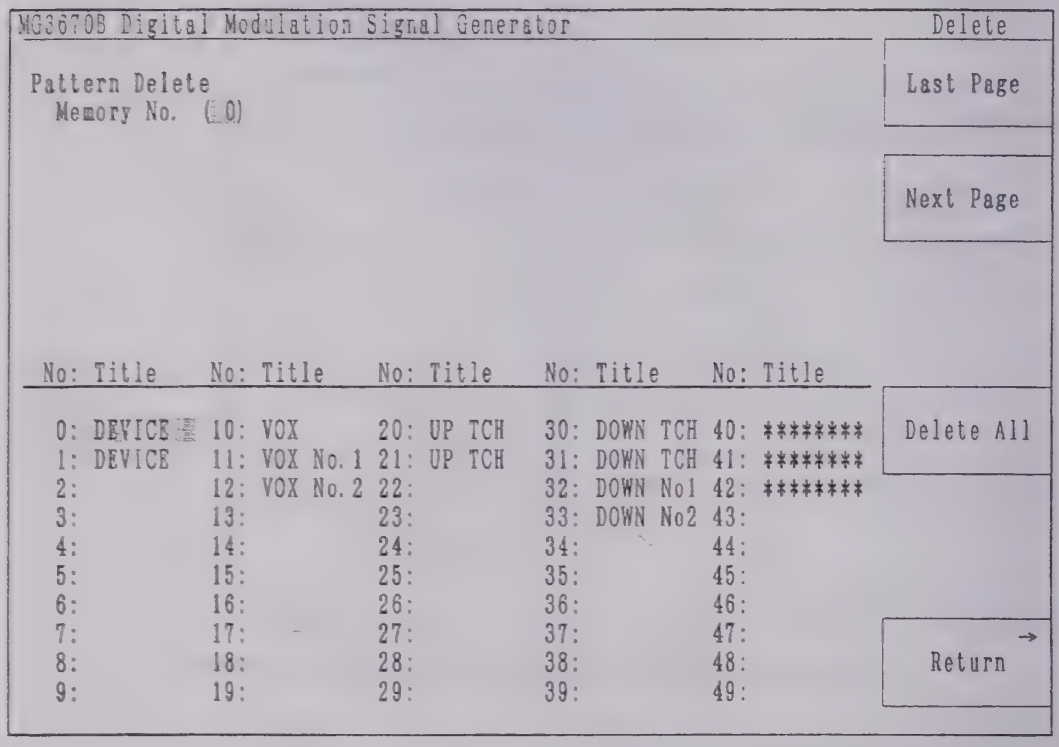



Fig. 2-6 Parameter Setting Screen
(modulation parameter setting mode, pattern data deletion)

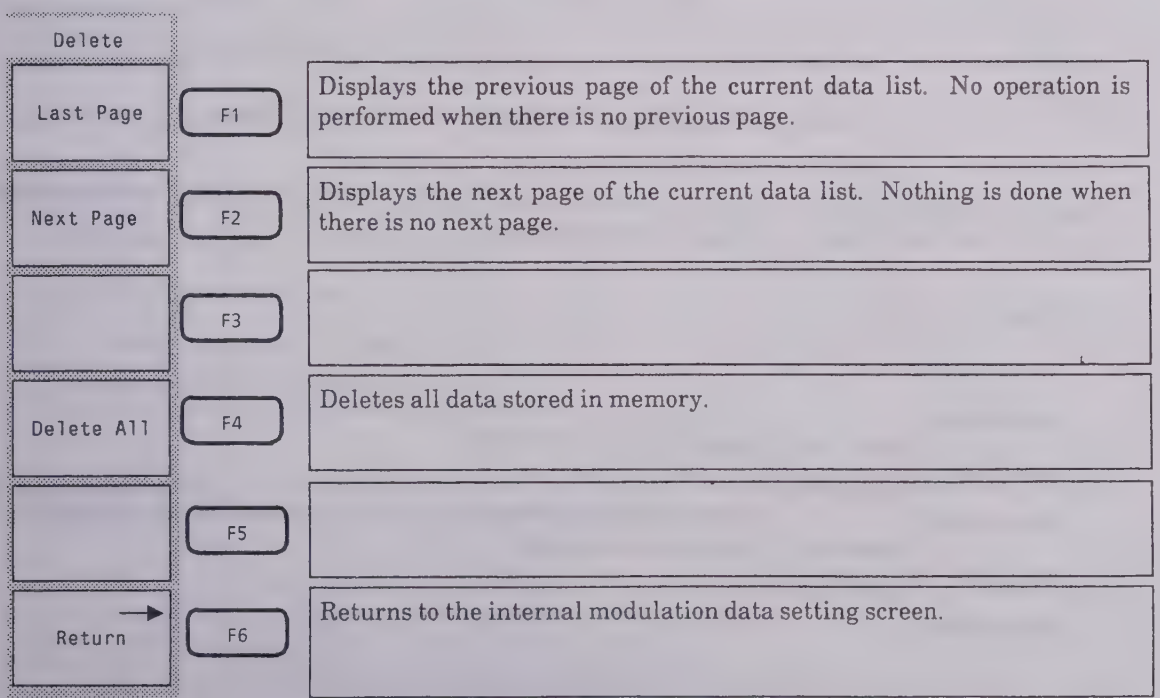
To delete all data in memory, press the 'Delete All' F4 soft key. 'All' is displayed in the memory number field and all data set in the list are reversely highlighted. A Yes/No window then appears for verification purposes. Press Yes to delete all of the data sets.

**Example:** Deletes the internal modulation data in memory location 10.

| Step | Action | Verification |
|---|---|---|
| 1 | Mod † | Switches to the modulation parameter setting mode and the Mod key's LED indicator lights. |
| 2 | Pattern Edit F2 | Switches to the internal modulation data setting screen. |
| 3 | Pattern Delete F2 | Switches to the internal modulation data delete screen. |
| 4 | 1 0 Set | Specifies memory location 10. (A Yes/No window opens for verification.) |
| 5 | Cursor < Set | Select Yes to delete the data. |

† There is no need to press the Mod key if its indicator is already lit.

## (2) Function keys


Delete
Last Page
F1
Displays the previous page of the current data list. No operation is performed when there is no previous page.
Next Page
F2
Displays the next page of the current data list. Nothing is done when there is no next page.
F3
Delete All
F4
Deletes all data stored in memory.
F5
Return
F6
Returns to the internal modulation data setting screen.

## 2.4.4 Listing internal modulation data

When the 'Pattern List' F3 soft key is pressed in the internal modulation data setting screen, the internal modulation data list screen appears. Use the data keys, rotary knob, Step keys and Cursor keys to specify the memory location number and then press the Set or Enter key to display in a window the internal modulation data stored in that location.

Initial memory location number: Currently saved memory location having the smallest

### (1) Screen

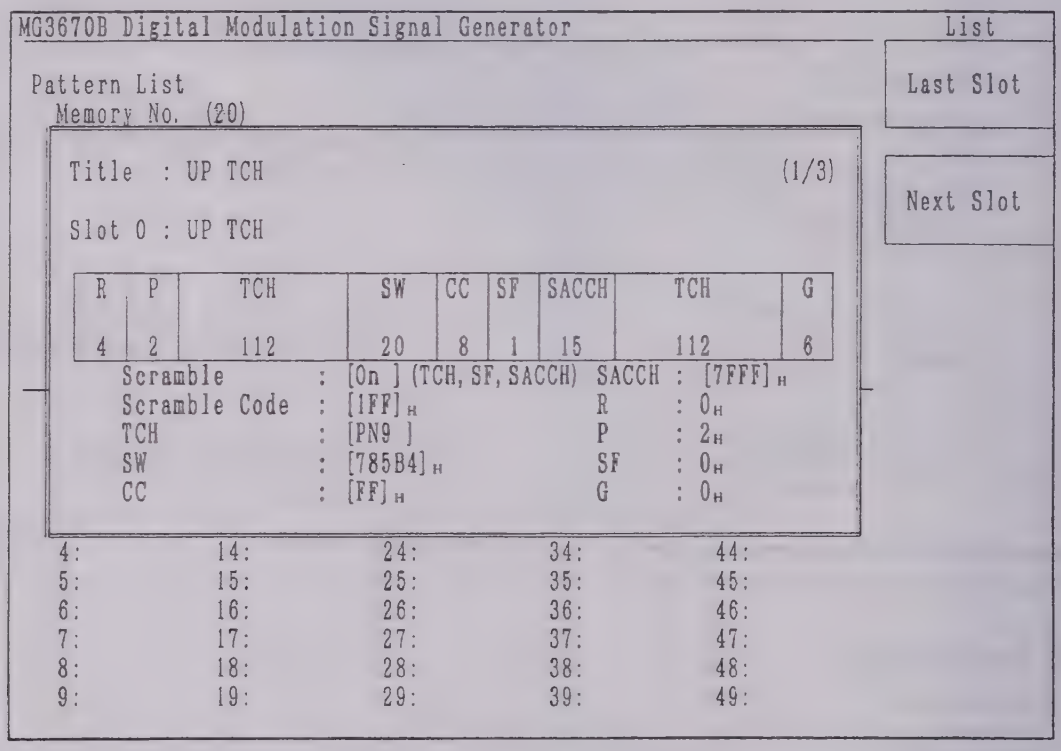
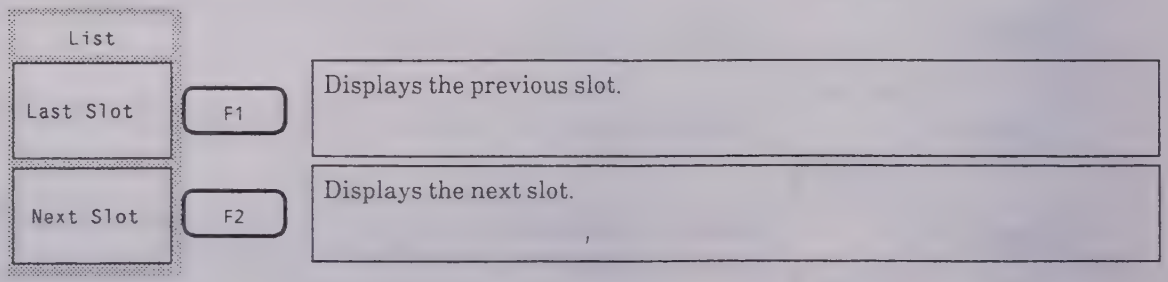

MG3670B Digital Modulation Signal Generator
List
Pattern List
Memory No. (20)
Last Slot
Next Slot
Title : UP TCH (1/3)
Slot 0 : UP TCH
R P TCH SW CC SF SACCH TCH G
4 2 112 20 8 1 15 112 6
Scramble : [On ] (TCH, SF, SACCH)
Scramble Code : [1FF]H
TCH : [PN9 ]
SW : [785B4]H
CC : [FF]H
SACCH : [7FFF]H
R : 0H
P : 2H
SF : 0H
G : 0H
4: 14: 24: 34: 44:
5: 15: 25: 35: 45:
6: 16: 26: 36: 46:
7: 17: 27: 37: 47:
8: 18: 28: 38: 48:
9: 19: 29: 39: 49:

**Fig. 2-7 Internal Modulation Data List Screen**

Internal modulation data is displayed per slot; Use the 'Last Slot' F1 and 'Next Slot ' F2 soft keys to select the slot. Press the Set or Cancel key to close the window.

### (2) Function keys



## 2.5 I, Q Signal Outputs

The I, Q signal outputs are always produced regardless of the I, Q modulation signal source setting (Int or Ext). The I, Q signals are described as follows:

| Setting | | I, Q signal output |
|---|---|---|
| Modulation | Source | |
| On | Int | Outputs I,Q signals corresponding to the currently set modulation. |
| | Ext | Outputs I,Q signals immediately before the source is set to Ext. |
| Off | —— | Outputs a DC voltage signal for non-modulated signals. |

***Note:*** *Only the DC voltage signal for non-modulated signals is output for models that are not equipped with a modulation unit.*

### (1) Setting the output level

The output level can be set within the range shown in the table below. However, the input and output settings will be the same. For details, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.

| I, Q Level | Impedance | | Input/Output level | Offset voltage |
|---|---|---|---|---|
| | Input | Output | | |
| 50 Ω 500 mV selected | 50 Ω | 50 Ω | 500 mVrms (Fixed) | 0 mV (Fixed) |
| CMOS selected | 100 kΩ | 600 Ω | 50 to 500 mVrms , 50 mVrms step | 0 to 4000mV, 1 mV step |

■ **Defining the output levels of the I, Q signals:**

Output level is $\sqrt{I^2 + Q^2}$ for '0000' pattern, terminated voltage;

terminated impedance is as follows:

When 50 Ω, 500 mV is selected: 50 Ω
When CMOS is selected: 600 Ω

***Note:*** *For details on the I, Q signals input level, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.*

### (2) I, Q output balance, offset and phase adjustment functions

When the I, Q output trimmer function is set to On, the adjustment function is activated. For details on the setting method, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.

#### ■ Balance adjustment function

The balance adjustment function fixes the amplitude of the Q signal and varies the amplitude of the I signal within ±20%.

#### ■ Offset adjustment function

The offset adjustment function adds an offset voltage ranging within ±0.1 V to the I and Q output signals. (The I signal offset voltage can be independently adjusted from the Q signal offset voltage.)

#### ■ Phase adjustment function

The phase adjustment function shifts the phase of the I signal within a ±10° range. This shift operation can be expressed in an equation as follows:

$I_{OUT} = I \cdot \cos\theta + Q \cdot \sin\theta$

$Q_{OUT} = Q$

$I_{OUT}$: I signal output when the I and Q signal adjustment function is On

$Q_{OUT}$: Q signal output when the I and Q signal adjustment function is On

I: I signal output when the I and Q signal adjustment function is Off

Q: Q signal output when the I and Q signal adjustment function is Off

$\theta$: Phase shift angle; Can be varied within ±10° with the trimmer

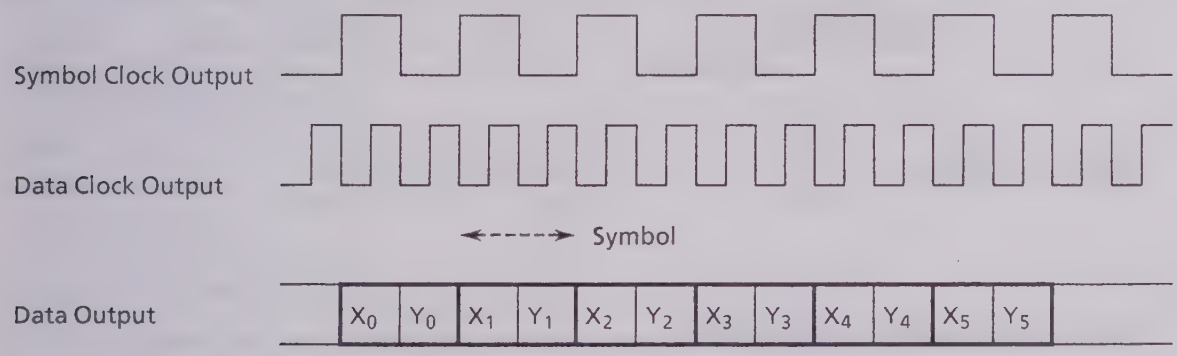
***Note:*** *The functions described above cannot be independently set On or Off.*

## 2.6 Auxiliary signal outputs

This section explains the control signals output from the MG3670 series • MG3660A rear panel. For details on the IQ DC offset, refer to the 'Panel Operating Instructions part ' in the MG3670 series • MG3660A (main instrument) operation manual.

### 2.6.1 Data, data clock and symbol clock signals

The output timings of the Data, Data Clock and Symbol Clock signals are shown below. In the figure, the polarities of the signals are expressed as positive or rising edge.




The symbol consists of Xn and Yn, where Xn indicates data that occurs before Yn.

### 2.6.2 Pattern sync signal

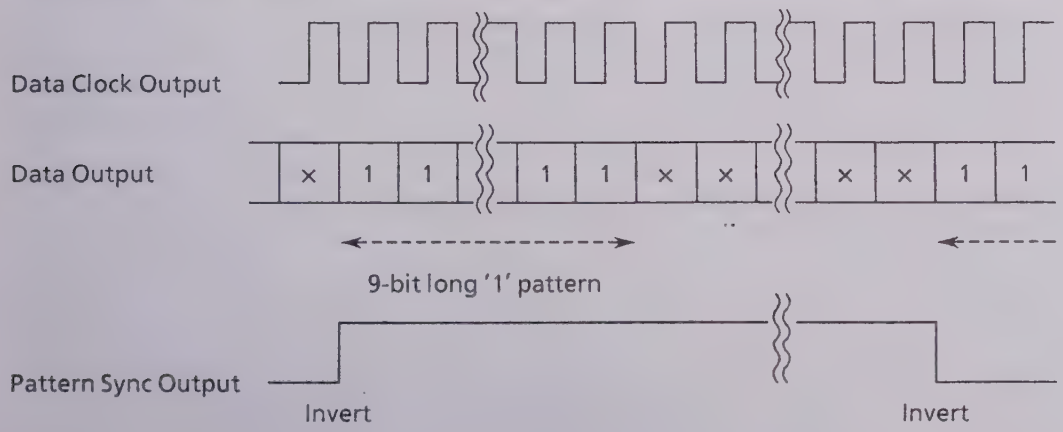
The Pattern Sync output signal that is produced depends on whether the burst function is On or Off. This is explained as follows:

#### (1) When burst function is Off:

When the burst function is off, the Pattern Sync Output signal allows a signal synchronized with the output pattern to be output.

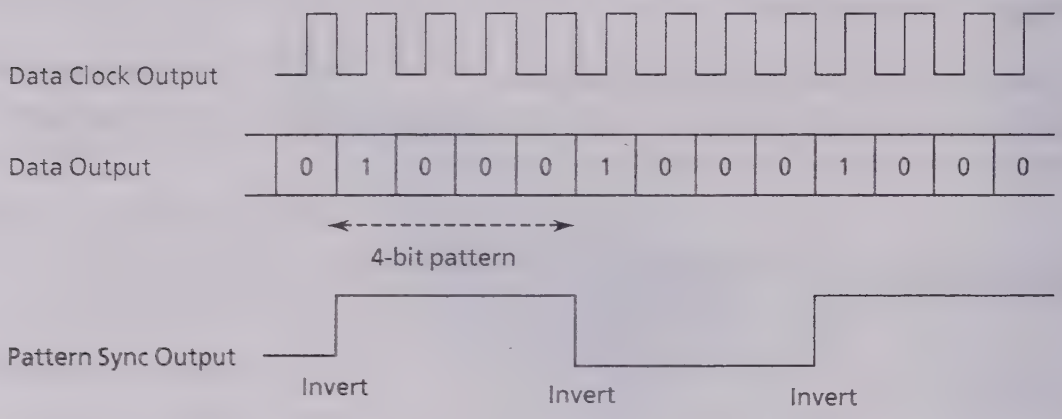
■ When PN pattern is selected

When PN9 is selected, an invert signal is output at the beginning of a pattern consisting of nine contiguous '1' bits. When PN15 is selected, an invert signal is output at the beginning of a pattern consisting of fifteen contiguous '0' bits. The output signal when PN9 is selected is shown below:



■ When 4-bit pattern is selected:

An invert signal is output at the beginning of the 4-bit pattern. The figure is based on a '1000' 4-bit pattern.




## (2) When the burst function is On

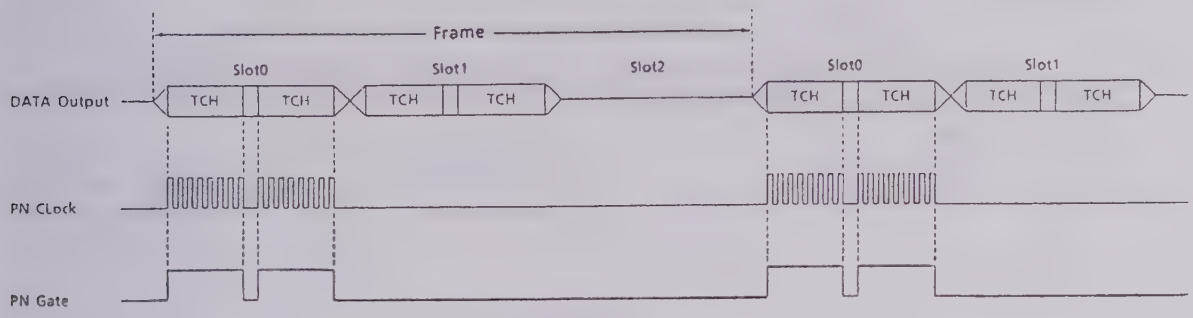
The Pattern Sync Output Signal allows when the burst function is On, a control signal synchronized with the frames to be output.

■ When the PN clock is selected

The clock signal of the pseudorandom pattern of the first output slot in the frame is output.

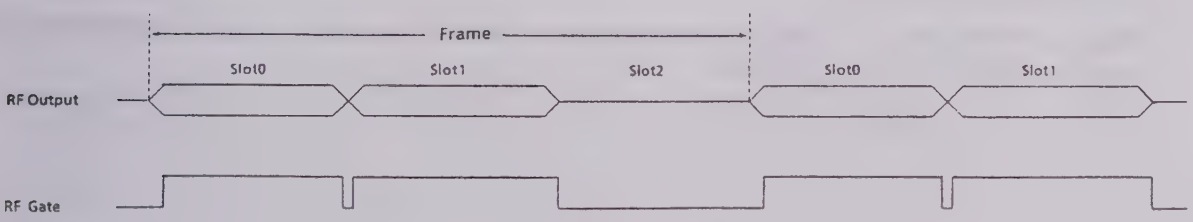
■ When the PN gate is selected

The gate signal of the pseudorandom pattern of the first output slot in the frame is output.

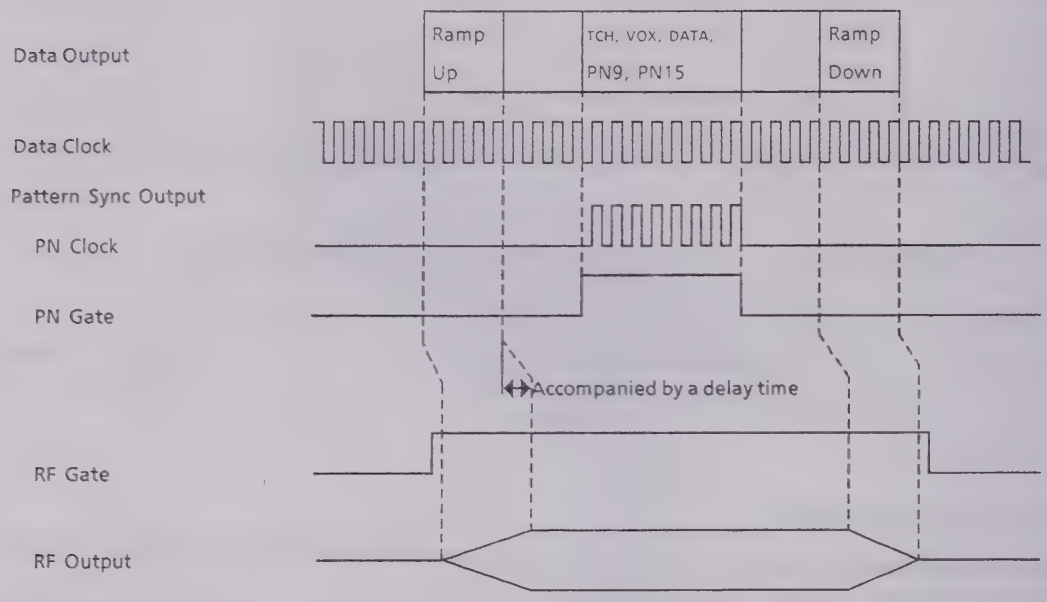



■ When the RF gate is selected

A control signal from the pulse modulation unit inside the main instrument is output.

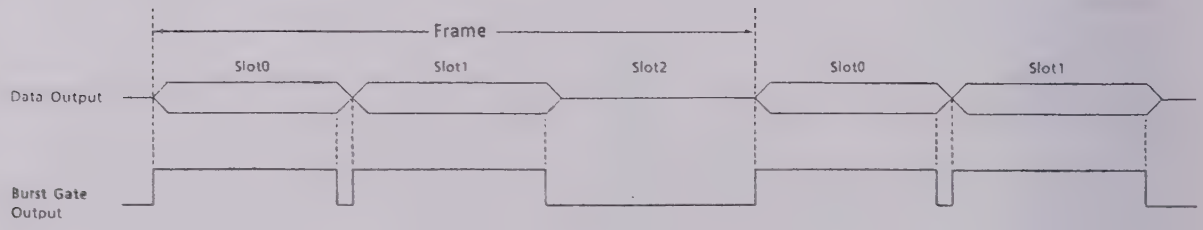


The details about the slot are shown in the figure below. The format of the slot in this figure is for explanation purposes only and differs from the actual system.

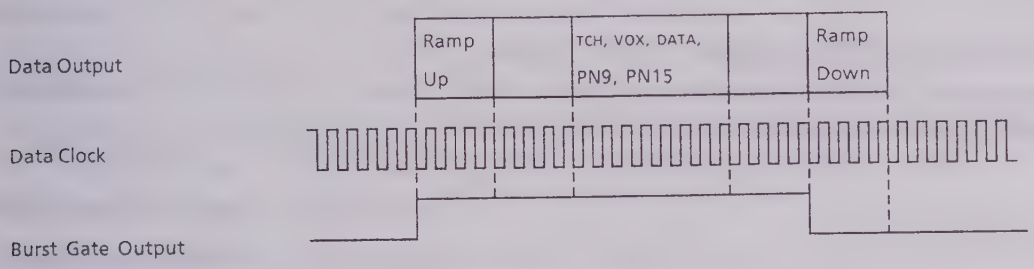



## 2.6.3 Burst gate signal

When the burst function is on and the internal pattern is used for modulation, a signal synchronized with the output slot in the frame is output..



The details about the slot are shown in the figure below. The format of the slot in this figure are for explanation purposes only and differs from the actual system.

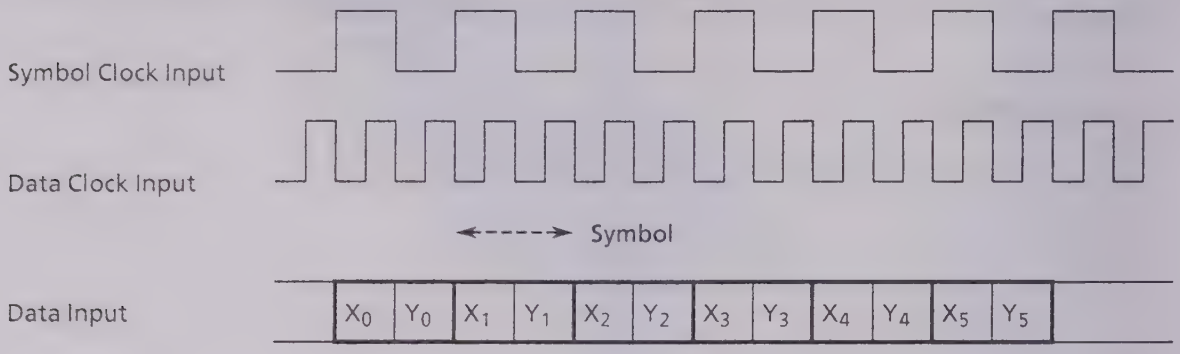


## 2.7 Auxiliary Inputs Signal

This paragraph explains the control signals input from the MG3670 series • MG3660A front panel.

### 2.7.1 Data, data clock and symbol clock signals

The input timings of the Data, Data Clock and Symbol Clock signals are shown below. In the figure, the polarities of the signals are expressed as positive or rising edge.



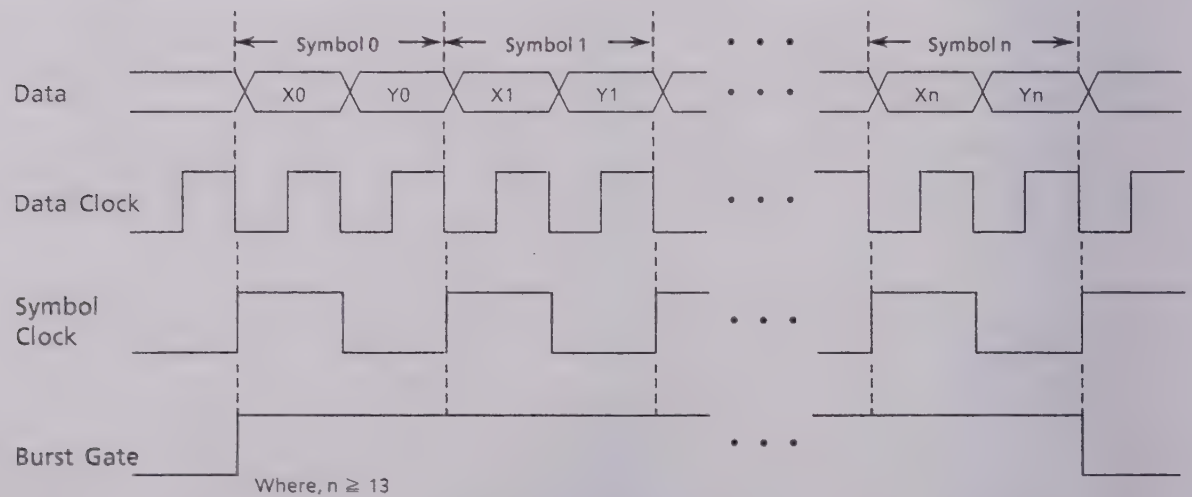

The symbol consists of Xn and Yn, where Xn indicates data that occurs before Yn.

***Note:*** *To input only one or two signals, synchronize the timing(s) with the output signal(s) of the signal(s) that will not be inputted.*

### 2.7.2 Burst gate signal

When the burst function is On and data input is set to Ext, the burst gate signal can be fed externally. This signal can be fed in synchronously with the data signal timing in order to generate an RF burst signal identical to the burst signal generated from the internal pattern. (This will smoothen the slope of the rising and falling edges and prevent the spectrum from deteriorating.)

Shown below are the input timings of the Data, Data Clock, Symbol Clock and Burst Gate signals.




***Note:*** *The rising and falling edges of the power corresponds to Symbol 0, 1 and Symbol n+1, n+2, respectively.*

## 2.8 Symbol Adjust Function

This function sets the symbol synchronization state in the case of $\pi/4$ DQPSK modulation.

■ Automatic synchronization function:

Function that synchronizes the internal symbol with the symbol clock input when in the symbol clock input mode.

Process: When the appropriate symbol clock is fed, the 'Symbol Adjust' F1 soft key disappears from the screen and the internal symbol is synchronized with the fed symbol clock.

■ Synchronization state select function:

Function that selects the symbol synchronization state when there is no symbol clock input in the symbol clock input mode.

Process: The symbol synchronization mode changes each time the 'Symbol Adjust' F1 soft key is pressed.

Shown below are the main instrument settings that can be used by the symbol adjust function.

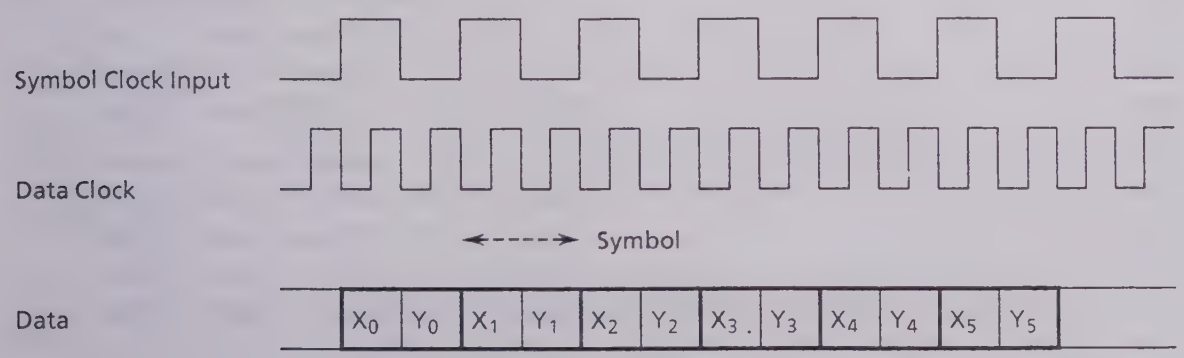
| MG3670 series • MG3660A setting | | Symbol Adjust function |
|---|---|---|
| Data Clock | Data | |
| Int | Int | Invalid |
| Int | Ext | Valid |
| Ext | Int | Valid |
| Ext | Ext | Valid |

Invalid: Symbol clock cannot be input.

Valid: Synchronizes the symbol with the input symbol clock. When there is no input symbol clock, the symbol case, the Symbol Adjust key is used to select the symbol synchronization mode.

■ Inputting the symbol clock:

The input timing of the symbol clock is shown below. The polarities of all the signals are expressed as positive or rising edge.




The symbol consists of Xn and Yn, where Xn indicates data that occurs before Yn.

## 2.9 Phase Encode Function

This function inverts the direction of phase change against modulation data, changing the differential phase encoding specification at the $\pi/4$DQPSK modulation. With this function, the right and left of modulation spectrum can be inverted with the carrier frequency as the center. The differential phase encoding specifications are shown in the table below.

**Differential phase encoding specifications at $\pi/4$DQPSK modulation**

| XY | Phase change $\Delta\Phi$ [rad] | | | |
|---|---|---|---|---|
| | PDC, PHP, NADC, PDC_H system | | TFTS system | |
| | Normal | Inverse | Normal | Inverse |
| 11 | $-3\pi/4$ | $3\pi/4$ | $\pi/4$ | $-\pi/4$ |
| 01 | $3\pi/4$ | $-3\pi/4$ | $3\pi/4$ | $-3\pi/4$ |
| 00 | $\pi/4$ | $-\pi/4$ | $-3\pi/4$ | $3\pi/4$ |
| 10 | $-\pi/4$ | $\pi/4$ | $-\pi/4$ | $\pi/4$ |

***CAUTION:*** *X and Y represent symbols composed of 2 bits each. X advances to Y timewise.*

# SECTION 3
# DETAILED OPERATIONS

This section describes the operation, generated patterns and the trigger function of the MG0301C $\pi/4$ DQPSK Modulation Unit and the MG0303B Burst Function Unit for each system.

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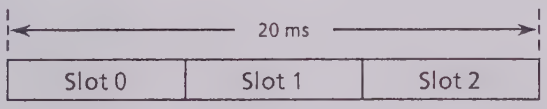
# SECTION 3
# DETAILED OPERATIONS

## 3.1 Operating the PDC System

### 3.1.1 Frame composition

The TDMA frame consists of three slots. Signals are generated with one frame as one cycle. The PN9/PN15 pseudorandom pattern is independent for each slot and is continuous.




### 3.1.2 Slot composition

There are four types of slot for this system, namely, device evaluation slot, communication channel (uplink/downlink) and VOX control slot.

#### (1) Device evaluation slot (DEVICE)

| R | PN | G |
|---|---|---|
| 4 | 270 | 6 |

R: Ramp time ..... $0_H$ (4 bits)
PN: Pseudorandom pattern ..... Independent PN9 pseudorandom pattern per slot
(The PN pattern in the same slot is continuous.)
G: Guard time ..... $00_H$ (6 bits)

[Setting parameter]

- PN: PN9 or PN15 pseudorandom pattern

## (2) Uplink communication channel (UP TCH)

| R | P | TCH | SW | CC | SF | SACCH | TCH | G |
|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 112 | 20 | 8 | 1 | 15 | 112 | 6 |

R: Ramp time ..... $0_H$ (4 bits)
P: Preamble ..... $2_H$ (2 bits)
TCH: Traffic channel ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the TCH field of the same slot is continuous.)
SW: Synchronization word ..... Slot 0 = $785b4_H$ (20 bits) ,
Slot 1 = $62DC9_H$ (20 bits) ,
Slot 2 = $7E28A_H$ (20 bits)
CC: Color code ..... $00_H$ (8 bits)
SF: Steal flag ..... $0_H$ (1 bit)
SACCH: Slow associated control channel ..... $0000_H$ (15 bits)
G: Guard time ..... $00_H$ (6 bits)
Scramble function (TCH, SF, SACCH): ..... On
Scramble code: ..... $000_H$ (9 bits)

[Setting parameter]

- CC: $00_H$ to $FF_H$ (8 bits)
- SACCH: $0000_H$ to $7FFF_H$ (15 bits)
- TCH: PN9 or PN15 pseudorandom pattern
- SW: $00000_H$ to $FFFFF_H$ (20 bits)
- Scramble function: On / Off
- Scramble code: $000_H$ to $1FF_H$ (9 bits)

## (3) Downlink communication channel (DOWN TCH)

| R | P | TCH | SW | CC | SF | SACCH | TCH |
|---|---|---|---|---|---|---|---|
| 4 | 2 | 112 | 20 | 8 | 1 | 21 | 112 |

R: Ramp time ..... $0_H$ (4 bits)
P: Preamble ..... $2_H$ (2 bits)
TCH: Traffic channel ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the TCH field of the same slot is continuous.)
SW: Synchronization word ..... Slot 0 = $87A4B_H$ (20 bits) ,
Slot 1 = $9D236_H$ (20 bits) ,
Slot 2 = $81D75_H$ (20 bits)
CC: Color code ..... $00_H$ (8 bits)
SF: Steal flag ..... $0_H$ (1 bit)
SACCH: Slow associated control channel ..... $000000_H$ (21 bits)
Scramble function (TCH, SF, SACCH): ..... On
Scramble code: ..... All $000_H$ (9 bits)

[Setting parameter]

- CC: $00_H$ to $FF_H$ (8 bits)
- SACCH: $000000_H$ to $1FFFFF_H$ (21 bits)
- TCH: PN9 or PN15 pseudorandom pattern
- SW: $00000_H$ to $FFFFF_H$ (20 bits)
- Scramble function: On / Off
- Scramble code: $000_H$ to $1FF_H$ (9 bits)

## (4) VOX control (VOX)

| G | R | P | SW | CC | SF | SACCH | G |
|---|---|---|---|---|---|---|---|
| 108 | 4 | 6 | 20 | 8 | 1 | 15 | 118 |

R: Ramp time ..... $0_H$ (4 bits)
G: Guard time ..... $0_H$ (118 bits)
P: Preamble ..... $26_H$ (6 bits)
SW: Synchronization word ..... Slot 0 = $785b4_H$, (20 bits)
Slot 1 = $62DC9_H$, (20 bits)
Slot 2 = $7E28A_H$, (20 bits)
CC: Color code ..... $00_H$ (8 bits)
SF: Steal flag ..... $0_H$ (1 bit)
SACCH: Slow associated control channel ..... $0000_H$ (15 bits)
Scramble function (SF, SACCH): ..... On
Scramble code: ..... $000_H$ (9 bits)

[Setting parameter]

- CC: $00_H$ to $FF_H$ (8 bits)
- SACCH: $0000_H$ to $7FFF_H$ (15 bits)
- SW: $00000_H$ to $FFFFF_H$ (20 bits)
- Scramble function: On / Off
- Scramble code: $000_H$ to $1FF_H$ (9 bits)

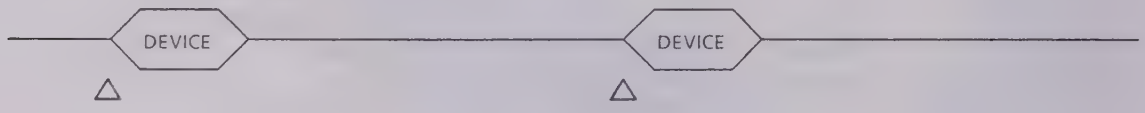
### 3.1.3 Standard internal modulation data

There are six types of standard internal modulation data in the PDC system. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting mode).

*Note:* • *'△' indicates the position of the burst trigger.*
• *All the slots 0 to 2 cannot be set to Off.*

#### (1) DEVICE

RF output using slot 0 as the device evaluation slot

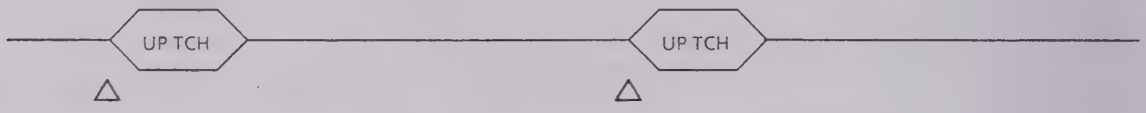



[ Setting parameter ]

- Slot: Slots 0 to 2 can be set to either DEVICE or OFF.

#### (2) UP TCH

RF output using slot 0 as the uplink communications channel

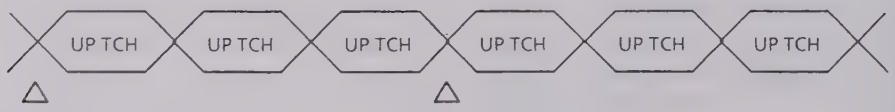



[ Setting parameter ]

- Slot: Slots 0 to 2 can be set to UP TCH, VOX or OFF

#### (3) UP TCH ALL

RF output using All the slots 0 to 2 as uplink communications channels

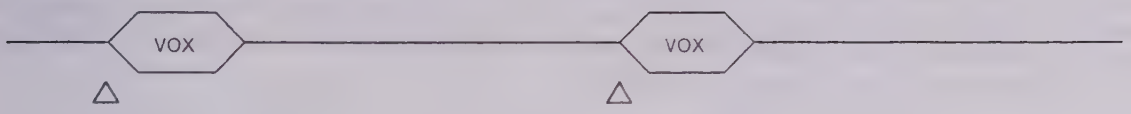



[ Setting parameter ]

- Slot: Slots 0 to 2 can be set to UP TCH, VOX or OFF

## (4) UP VOX

RF output using slot 0 as the VOX control slot




【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to UP TCH, VOX or OFF

## (5) DOWN TCH (DN TCH)

RF output using slot 0 as the downlink communications channel; The RF output is a continuous wave.

【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to UP TCH, VOX or OFF.
  (The output from an Off slot will consist of pure 1's.)

## (6) DOWN TCH ALL (DN TCH ALL)

RF output using All the slots 0 to 2 as downlink communications channels; The RF output is a continuous wave.

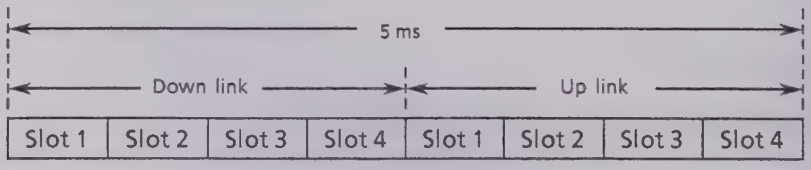
【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to UP TCH, VOX or OFF.
  (The output from an OFF slot will consist of pure 1's.)

## 3.2 Operating the PHP System

### 3.2.1 Frame composition

A TDMA frame consists of a total of 8 slots, four slot for the downlink and another four slot for the uplink. Signals are generated with one frame considered as one cycle. However, VOX control signals are generated with four frames equal to 20 ms. A slot output is produced for the first frame only, and no slot output is produced for the succeeding 2 to 4 frames. The PN9/PN15 pseudorandom pattern in the TCH of a slot is independent for each slot and is continuous.




### 3.2.2 Slot composition

There are four types of slots for this system, namely, device evaluation slot, TCH communication slot, VOX control slot and sync burst slot.

#### (1) Device evaluation (DEVICE)

| R | PN | G |
|---|---|---|
| 4 | 220 | 16 |

R: Ramp time ..... $0_H$ (4 bits)
PN: pseudorandom pattern ..... Independent PN9 pseudrordom pattern per slot (PN pattern in the same slot is continuous.)
G: Guard time ..... $0000_H$ (16 bits)
[Setting parameter]
•PN: PN9 or PN15 pseudorandom pattern

## (2) Traffic channel (TCH)

| R | SS | PR | UW | CI | SA | TCH | CRC | G |
|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 6 | 16 | 4 | 16 | 160 | 16 | 16 |

| | | |
|---|---|---|
| R: | Ramp time | $0_H$ (4 bits) |
| SS: | Start symbol | $2_H$ (2 bits) |
| RR: | Preamble | $19_H$ (6 bits) |
| UW: | Unique word | Uplink = $E149_H$ (16 bits)<br>Downlink = $3D4C_H$ (16 bits) |
| CI: | Channel identifier | $0_H$ (4 bits) |
| SA: | SACCH (Slow associated control channel) | $8000_H$ (16 bits) |
| TCH: | Traffic channel | Independent PN9 pseudorandom pattern per slot (The PN pattern in the TCH field of the same slot is continuous.) |
| CRC: | Cyclic redundancy check | CRC bits of CI, SA, and TCH |
| G: | Guard time | $0000_H$ (16 bits) |
| Scramble function (TCH, CRC) | | On |
| Scramble code | | $200_H$ (10 bits) |
| Simple security function (TCH) | | On |
| Password code | | $0000_H$ (16 bits) |

[Setting parameter]

- UW: $0000_H$ to $FFFF_H$ (16 bits)
- SA: $0000_H$ to $FFFF_H$ (16 bits)
- TCH: PN9 or PN15 pseudorandom pattern
- Scramble function: On / Off
- Scramble code: $000_H$ to $3FF_H$ (10bits)
- Simple security function: On / Off
- Password code: $0000_H$ to $FFFF_H$ (16bits)

## (3) Voice operated transmission (VOX)

| R | SS | PR | UW | CI | SA | VOX | CRC | G |
|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 6 | 16 | 4 | 16 | 160 | 16 | 16 |

R: Ramp time ..... $0_H$ (4 bits)
SS: Start symbol ..... $2_H$ (2 bits)
RR: Preamble ..... $19_H$ (6 bits)
UW: Unique word ..... Uplink = $E149_H$ (16 bits)
Downlink = $3D4C_H$ (16 bits)
CI: Channel identifier ..... $F_H$ (4 bits)
SA: SACCH (Slow associated control channel) ..... $8000_H$ (16 bits)
TCH: Traffic channel ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the VOX field of the same slot is continuous.)
CRC: Cyclic redundancy check ..... CRC bits of CI, SA, and TCH
G: Guard time ..... $0000_H$ (16 bits)
Scramble function (TCH, CRC) ..... On
Scramble code ..... $200_H$ (10 bits)
Simple security function (TCH) ..... On
Password code ..... $0000_H$ (16 bits)

[Setting parameter]

- UW: $0000_H$ to $FFFF_H$ (16 bits)
- SA: $0000_H$ to $FFFF_H$ (16 bits)
- TCH: PN9 or PN15 pseudorandom pattern
- Scramble function: On / Off
- Scramble code: $000_H$ to $3FF_H$ (10 bits)
- Simple security function: On / Off
- Password code: $0000_H$ to $FFFF_H$ (16 bits)

## (4) Sync burst (SYNC)

| R | SS | PR | UW | CI | CS-ID | PS-ID | Idle | CRC | G |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 62 | 32 | 4 | 42 | 28 | 34 | 16 | 16 |

R: Ramp time ..... $0_H$ (4 bits)
SS: Start symbol ..... $2_H$ (2 bits)
RR: Preamble ..... $1999999999999999_H$ (62 bits)
UW: Unique word ..... Uplink = $68899AF0_H$ (32 bits)
Downlink = $50EF2993_H$ (32 bits)
CI: Channel identifier ..... $9_H$ (4 bits)
CS-ID: Cell station ID code ..... $20200020001_H$ (42 bits)
PS-ID: Personal station ID code ..... $0000001_H$ (28 bits)
Idle: Idle bit ..... $000000000_H$ (34 bits)
CRC: Cyclic redundancy check ..... CRC bits of CI, CS-ID, PS-ID, and Idle
G: Guard time ..... $0000_H$ (16 bits)
Scramble function (CS-ID, PS-ID, Idle, CRC) ..... On
Scramble code ..... $200_H$ (16 bits)

[Setting parameter]

- UW: $00000000_H \sim FFFFFFFF_H$ (32 bits)
- CI: $0_H \sim F_H$ (4 bits)
- CS-ID: $00000000000_H \sim 3FFFFFFFFF_H$ (42 bits)
- PS-ID: $0000000_H \sim FFFFFFF_H$ (28 bits)
- Idle: $000000000_H \sim 3FFFFFFFF_H$ (34 bits)
- Scramble function: On / Off
- Scramble code: $000_H$ to $3FF_H$ (10 bits)

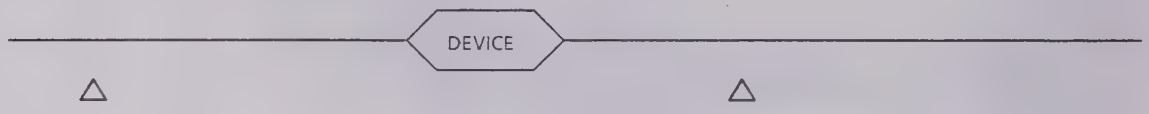
### 3.2.3 Standard internal modulation data

There are ten types of standard internal modulation data in the PHP system. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting mode).

***Note:*** ● *'△' indicates the position of the burst trigger.*
● *All the slots 1 to 4 cannot be set to Off.*

#### (1) DEVICE

RF output using the uplink circuit slot 1 as the device evaluation slot

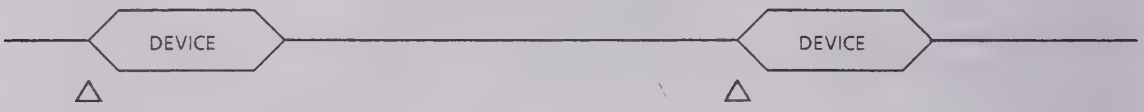



【 Setting parameter 】

● Slot: The uplink circuit slots 1 to 4 can be set to either DEVICE or OFF.

#### (2) DOWN DEVICE (DN DEVICE)

RF output using the downlink circuit slot 1 as the device evaluation slot




【 Setting parameter 】

● Slot: The downlink circuit slots 1 to 4 can be set to either DEVICE or OFF.

#### (3) UP TCH

RF output using the uplink circuit slot 1 as the TCH transmit slot

【 Setting parameter 】

● Slot: The uplink circuit slots 1 to 4 can be set to either TCH or OFF.

### (4) UP TCH ALL

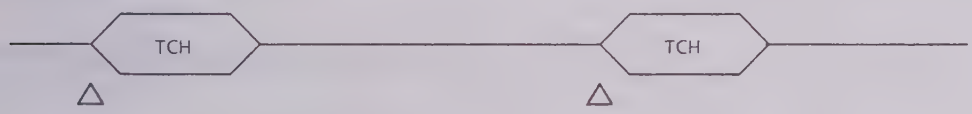
RF output using all the uplink circuits which include slots 1 to 4 as the TCH transmit slot

【 Setting parameter 】

- Slot: The uplink circuit slots 1 to 4 can be set to either UP TCH or OFF.

### (5) DOWN TCH (DN TCH)

RF output using the downlink circuit slot 1 as the TCH transmit slot




【 Setting parameter 】

- Slot: The downlink circuit slots 1 to 4 can be set to DOWN TCH, VOX, or OFF.

### (6) DOWN TCH ALL (DN TCH ALL)

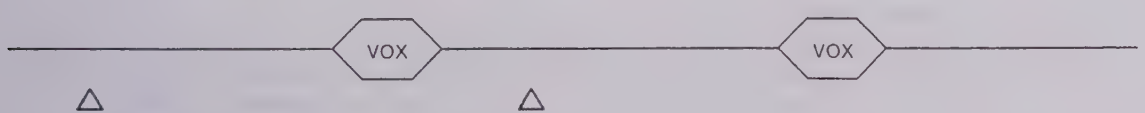
RF output using all the downlink circuits which include slots 1 to 4 as the TCH transmit slot

【 Setting parameter 】

- Slot: The downlink circuit slots 1 to 4 can be set to DOWN TCH, VOX, or OFF.

### (7) UP VOX

RF output using the uplink circuit slot 1 as VOX control slot




【 Setting parameter 】

- Slot: The uplink circuit slots 1 to 4 can be set to either VOX or OFF.

**Note:** *The VOX control slot is produced every four frames. The burst trigger is also generated once every 4 frames.*

## (8) DOWN VOX (DN VOX)

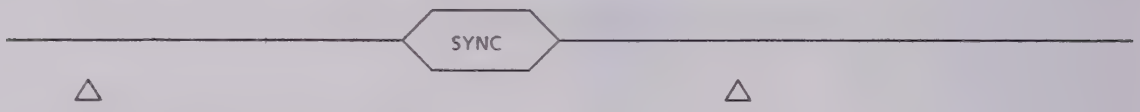
RF output using downlink slot 1 as the VOX control slot

【 Setting parameter 】

- Slot: Downlink slots 1 to 4 can be set to TCH, VOX or OFF.

## (9) UP SYNC

RF output using uplink slot 1 as the sync burst slot




【 Setting parameter 】

- Slot: The uplink slots 1 to 4 can be set to either TCH or OFF.
  Either one of slots can be set to SYNC.

## (10) DOWN SYNC (DN SYNC)

RF output using downlink slot 1 as the sync burst slot

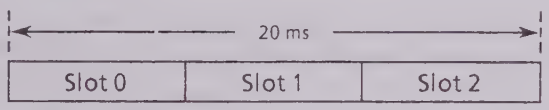
【 Setting parameter 】

- Slot: The downlink slots 1 to 4 can be set to either TCH, VOX or OFF.
  Either one of slots can be set to SYNC.

## 3.3 Operating the NADC System

### 3.3.1 Frame composition

A frame consists of 3 slots. Signals are generated with one frame considered as one cycle. The PN9 pseudorandom pattern in the data field of each slot is independent for every slot and is continuous.




### 3.3.2 Slot composition

There are three types of slot for this system, namely, device evaluation slot and uplink and downlink communications channel slots.

#### (1) Device evaluation slot (DEVICE)

| G | R | PN |
|---|---|---|
| 6 | 6 | 312 |

G: Guard time ..... $00_H$ (6 bits)
R: Ramp time ..... $00_H$ (6 bits)
PN: Pseudorandom pattern ..... Independent PN9 pseudorandom pattern per slot (PN pattern in the same slot is continuous)

[Setting parameter]
- PN: PN9 or PN15 pseudorandom pattern

#### (2) Uplink communications channel (UP TCH)

| G | R | DATA | SYNC | DATA | SACCH | CDVCC | DATA |
|---|---|---|---|---|---|---|---|
| 6 | 6 | 16 | 28 | 122 | 12 | 12 | 122 |

G: Guard time ..... $00_H$ (6 bits)
R: Ramp time ..... $00_H$ (6 bits)
DATA: User data transfer ..... Independent PN9 pseudorandom pattern per slot(The PN pattern in the DATA field of the same slot is continuous.)
SYNC: Synchronization word ..... Slot 0 = $A91DE4A_H$ (28 bits),
Slot 1 = $A9D127A_H$ (28 bits),
Slot 2 = $C7E3C0C_H$ (28 bits)
SACCH: Slow associated control channel ..... $000_H$ (12 bits)
CDVCC: Color code ..... $000_H$ (12 bits)

[Setting parameter]
- CDVCC: $000_H$ to $FFF_H$ (12 bits)
- SACCH: $000_H$ to $FFF_H$ (12 bits)
- SYNC $0000000_H$ to $FFFFFFF_H$ (28 bits)
- DATA: PN9 or PN15 pseudorandom pattern

### (3) Downlink communications channel (DOWN TCH)

| SYNC | SACCH | DATA | CDVCC | DATA | RSVD |
|---|---|---|---|---|---|
| 28 | 12 | 130 | 12 | 130 | 12 |

DATA: User data transfer ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the TCH field of the same slot is continuous).

SYNC: Synchronization word ..... Slot 0 = $A91DE4A_H$ (28 bits) ,
Slot 1 = $A9D127A_H$ (28 bits) ,
Slot 2 = $C7E3C0C_H$ (28 bits)

SACCH: Slow associated control channel ..... $000_H$ (12 bits)

CDVCC: Color code ..... $000_H$ (12 bits)

RSVD: Reserved ..... $000_H$ (12 bits)

[Setting parameter]

- CDVCC: $000_H$ to $FFF_H$ (12 bits)
- SACCH: $000_H$ to $FFF_H$ (12 bits)
- SYNC $0000000_H$ to $FFFFFFF_H$ (28 bits)
- DATA: PN9 or PN15 pseudorandom pattern

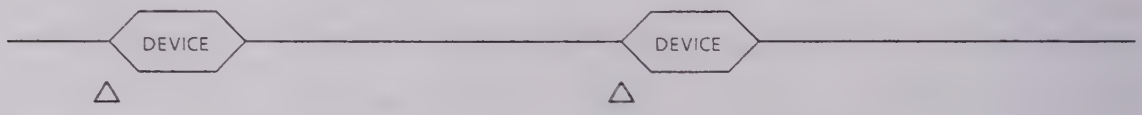
## 3.3.3 Standard internal modulation data

There are five types of standard internal modulation data available in the NADC system. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting mode).

*Note:* • *'△' indicates the position of the burst trigger.*
• *All the slots 0 to 2 cannot be set to Off.*

### (1) DEVICE

RF output using slot 0 as the device evaluation slot

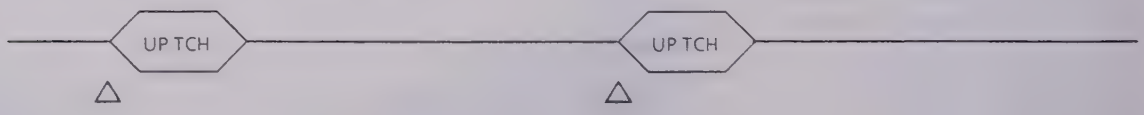



【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to DEVICE or OFF.

### (2) UP TCH

RF output using slot 0 as uplink communications channel slots



【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to UP TCH or OFF.

## (3) UP TCH ALL

RF output using All the slots 0 to 2 as uplink communications channel slots

【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to UP TCH or OFF.

## (4) DOWN TCH (DN TCH)

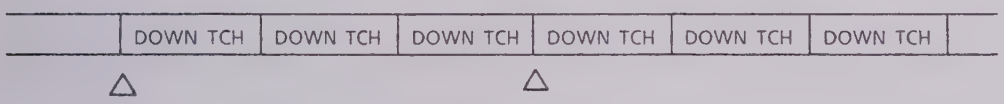
RF output using slot 0 as the downlink communications channel slot. Slots 1 to 2 are continuous waves made up of pure 1's.

【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to DOWN TCH or OFF. (All '1' are output for slot off)

## (5) DOWN TCH ALL (DN TCH ALL)

RF output using all of the slots 0 to 2 as the downlink communication channel slot



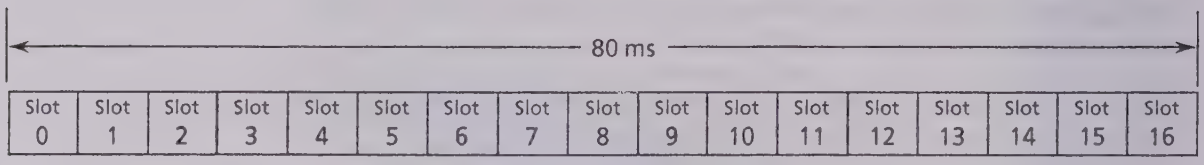

【 Setting parameter 】

- Slot: Slots 0 to 2 can be set to DOWN TCH or OFF. (All '1' are output for slot off)

## 3.4 Operating the TFTS System

### 3.4.1 Frame composition

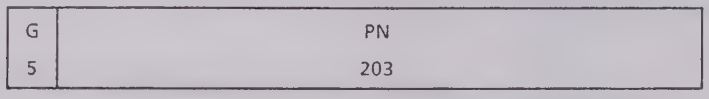
The TDMA frame consist of 17 slots. Signals are generated with one frame as one cycle. The PN9/PN15 pseudorandom pattern is independent for each slot and is continuous.




### 3.4.2 Slot composition

There are two types of slot for this system,namely,device evaluation slot and communications channel slot.

#### (1) Device evaluation slot (DEVICE)




G: Guard time ..... $1F_H$ (5bits)
PN: Pseudorandom pattern ..... Independent PN9 pseudorandom pattern per slot (PN pattern in continuous)

[Setting parameter]

- PN: PN9 or PN15 pseudorandom pattern

## (2) Traffic channel (TCH)

| G | S | DATA |
|---|---|---|
| 5 | 11 | 192 |

G: Guard time ..... $1F_H$ (5bits)
S: Synchronization word ..... $414_H$ (11bits)
DATA: Data ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the DATA field of the same slot is continuous.)

[Setting parameter]

- S: $000_H$ to $7FF_H$ (11bits)
- DATA: PN9 or PN15 pseudorandom pattern

### 3.4.3 Standard internal modulation data

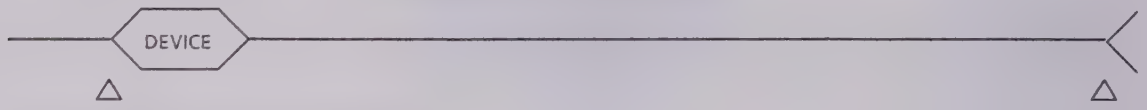
There are five types of standard internal modulation data in TFTS system. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting mode).

*Note:* • *'△ 'indicates the position of the burst trigger.*

• *All the slots 0 to 16 cannot be set to Off.*

#### (1) DEVICE

RF output using slot 0 as the device evalution slot

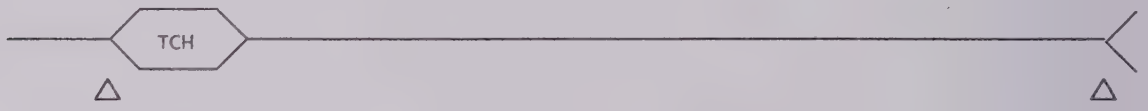



[Setting parameter]

- Slot:Slot 0 to 15 can be set to either DEVICE or OFF.
  Slot 16 is set to OFF.(Fixed)
  RF output is continuous wave when adjacent slots are set to DEVICE.

#### (2) UP TCH

RF output using slot 0 as the traffic channel




[Setting parameter]

- Slot:Slot 0 to 15 can be set to either TCH or OFF.
  Slot 16 is set to OFF.(Fixed)
  RF output is continuous wave when adjacent slots are set to TCH.

### (3) UP TCH ALL

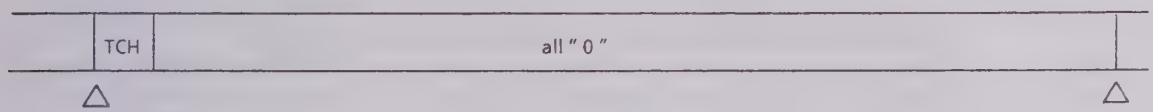
RF output using slots 0 to 15 as the traffic channel

[Setting parameter]

- Slot:Slot 0 to 15 can be set to either TCH or OFF
  Slot 16 is set to OFF.(Fixed)
  RF output is continuous wave when adjacent slots are set to TCH.

### (4) DOWN TCH (DN TCH)

RF output using slot 0 as the traffic channel; The RF output is a continuous wave.




[Setting parameter]

- Slot:Slot 0 to 16 can be set to either TCH or OFF.
  (All'0' are output for slot off)

### (5) DOWN TCH ALL (DN TCH ALL)

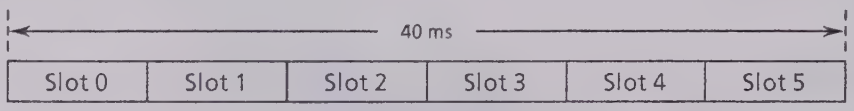
RF output using all the slots 0 to 16 as traffic channel; The RF output is a continuous wave.

- Slot:Slot 0 to 16 can be set to either TCH or OFF.
  (All'0' are output for slot off)

## 3.5 Operating the PDC__H System

### 3.5.1 Frame composition

The TDMA frame consists of six slots. Signals are generated with one frame as one cycle. The PN9/PN15 pseudorandom pattern is independent for each slot and is continuous.




### 3.5.2 Slot composition

There are four types of slot for this system, namely, device evaluation slot, communication channel (uplink/downlink) and VOX control slot.

#### (1) Device evaluation slot (DEVICE)

| R | PN | G |
|---|---|---|
| 4 | 270 | 6 |

R: Ramp time ..... $0_H$ (4 bits)
PN: Pseudorandom pattern ..... Independent PN9 pseudorandom pattern per slot
(The PN pattern in the same slot is continuous.)
G: Guard time ..... $00_H$ (6 bits)
[Setting parameter]
- PN: PN9 or PN15 pseudorandom pattern

## (2) Uplink communication channel (UP TCH)

| R | P | TCH | SW | CC | SF | SACCH | TCH | G |
|---|---|---|---|---|---|---|---|---|
| 4 | 2 | 112 | 20 | 8 | 1 | 15 | 112 | 6 |

R: Ramp time ..... $0_H$ (4 bits)

P: Preamble ..... $2_H$ (2 bits)

TCH: Traffic channel ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the TCH field of the same slot is continuous.)

SW: Synchronization word ..... Slot 0 = $785b4_H$ (20 bits),
Slot 1 = $62DC9_H$ (20 bits),
Slot 2 = $7E28A_H$ (20 bits),
Slot 3 = $56B15_H$ (20 bits),
Slot 4 = $AE9B3_H$ (20 bits),
Slot 5 = $B2621_H$ (20 bits)

CC: Color code ..... $00_H$ (8 bits)

SF: Steal flag ..... $0_H$ (1 bit)

SACCH: Slow associated control channel ..... $0000_H$ (15 bits)

G: Guard time ..... $00_H$ (6 bits)

Scramble function (TCH, SF, SACCH): ..... On

Scramble code: ..... $000_H$ (9 bits)

[Setting parameter]

- CC: $00_H$ to $FF_H$ (8 bits)
- SACCH: $0000_H$ to $7FFF_H$ (15 bits)
- TCH: PN9 or PN15 pseudorandom pattern
- SW: $00000_H$ to $FFFFF_H$ (20 bits)

## (3) Downlink communication channel (DOWN TCH)

| R | P | TCH | SW | CC | SF | SACCH | TCH |
|---|---|---|---|---|---|---|---|
| 4 | 2 | 112 | 20 | 8 | 1 | 21 | 112 |

R: Ramp time ..... $0_H$ (4 bits)

P: Preamble ..... $2_H$ (2 bits)

TCH: Traffic channel ..... Independent PN9 pseudorandom pattern per slot (The PN pattern in the TCH field of the same slot is continuous.)

SW: Synchronization word ..... Slot 0 = $87A4B_H$ (20 bits) ,
Slot 1 = $9D236_H$ (20 bits) ,
Slot 2 = $81D75_H$ (20 bits) ,
Slot 3 = $A94EA_H$ (20 bits) ,
Slot 4 = $5164C_H$ (20 bits) ,
Slot 5 = $4D9DE_H$ (20 bits)

CC: Color code ..... $00_H$ (8 bits)

SF: Steal flag ..... $0_H$ (1 bit)

SACCH: Slow associated control channel ..... $000000_H$ (21 bits)

Scramble function (TCH, SF, SACCH): ..... On

Scramble code: ..... All $000_H$ (9 bits)

[Setting parameter]

- CC: $00_H$ to $FF_H$ (8 bits)
- SACCH: $000000_H$ to $1FFFFF_H$ (21 bits)
- TCH: PN9 or PN15 pseudorandom pattern
- SW: $00000_H$ to $FFFFF_H$ (20 bits)
- Scramble function: On / Off
- Scramble code: $000_H$ to $1FF_H$ (9 bits)

## (4) VOX control (VOX)

| G | R | P | SW | CC | SF | SACCH | G |
|---|---|---|---|---|---|---|---|
| 108 | 4 | 6 | 20 | 8 | 1 | 15 | 118 |

R: Ramp time ..... $0_H$ (4 bits)
G: Guard time ..... $0_H$ (118 bits)
P: Preamble ..... $26_H$ (6 bits)
SW: Synchronization word ..... Slot 0 = $785b4_H$ (20 bits),
Slot 1 = $62DC9_H$ (20 bits),
Slot 2 = $7E28A_H$ (20 bits),
Slot 3 = $56B15_H$ (20 bits),
Slot 4 = $AE9B3_H$ (20 bits),
Slot 5 = $B2621_H$ (20 bits)
CC: Color code ..... $00_H$ (8 bits)
SF: Steal flag ..... $0_H$ (1 bit)
SACCH: Slow associated control channel ..... $0000_H$ (15 bits)
Scramble function (SF, SACCH): ..... On
Scramble code: ..... $000_H$ (9 bits)

[Setting parameter]

- CC: $00_H$ to $FF_H$ (8 bits)
- SACCH: $0000_H$ to $7FFF_H$ (15 bits)
- SW: $00000_H$ to $FFFFF_H$ (20 bits)
- Scramble function: On / Off
- Scramble code: $000_H$ to $1FF_H$ (9 bits)

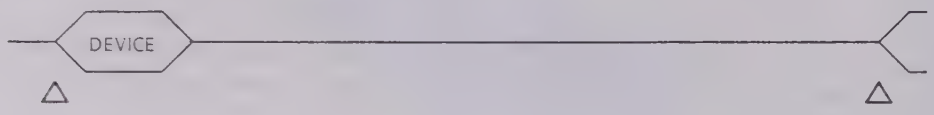
### 3.5.3 Standard internal modulation data

There are six types of standard internal modulation data available in the PDC__H system. To select the type of data, use 'Pattern' in the parameter setting screen (modulation parameter setting screen).

***Note:*** • *'△' indicates the position of the burst trigger.*
• *All the slots 0 to 5 cannot be set to Off.*

#### (1) DEVICE

RF output using slot 0 as the device evalution slot

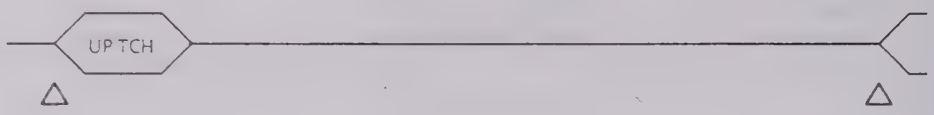



[Setting parameter]

- Slot: Slots 0 to 5 can be set to DEVICE or OFF.

#### (2) UP TCH

RF output using slot 0 as uplink communications channel slots

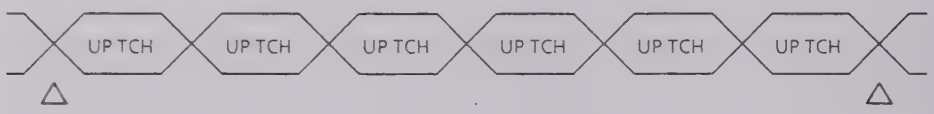



[Setting parameter]

- Slot: Slots 0 to 5 can be set to UP TCH, VOX or OFF.

#### (3) UP TCH ALL

RF output using all the slots 0 to 5 as uplink communications channel slots




[Setting parameter]

- Slot: Slots 0 to 5 can be set to UP TCH, VOX or OFF.

## (4) UP VOX

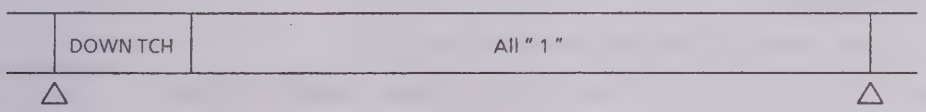
RF output using slot 0 as the VOX control slot

[Setting parameter]

- Slot: Slots 0 to 5 can be set to UP TCH, VOX or OFF.

## (5) DOWN TCH (DN TCH)

RF output using slot 0 as the downlink communications channel slot. The RF output is a continuous wave.
All "1" are output for slot off.

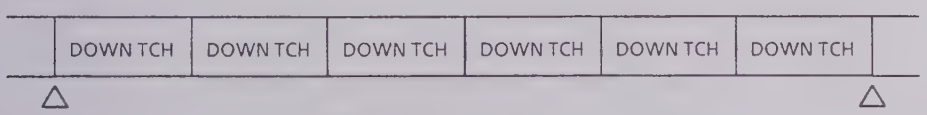



[Setting parameter]

- Slot: Slots 0 to 5 can be set to either DOWN TCH or OFF.

## (6) DOWN TCH ALL (DN TCH ALL)

RF output using all the slots 0 to 5 as downlink communications channels; The RF output is a continuous wave.
All "1" are output for slot off.




[Setting parameter]

- Slot: Slots 0 to 5 can be set to DOWN TCH or OFF.

## 3.6 Detailed Trigger Function

There are two trigger functions for generating burst signals when the burst function is on. These are:

① Internal trigger that works synchronously with the internal trigger signal
② External trigger that works synchronously with the external trigger signal.

### 3.6.1 Operation of the internal trigger

An internal trigger works by generating a burst signal synchronous with the internal trigger signal. This trigger signal is output from the Burst Trig Output connector on the rear panel. Since the trigger signal is produced at every cycle of the burst signal, its period can be fixed in every system.

### 3.6.2 Operation of the external trigger

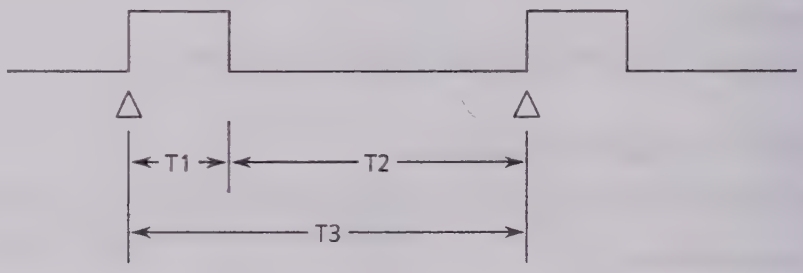
An external trigger works by generating a burst signal synchronous with the external fed trigger signal. This trigger signal is fed to the Burst Trig Input connector on the rear panel.

#### (1) External trigger signal input conditions

(a) Input level: TTL level

(b) Polarity : Either rising or falling edge can be selected

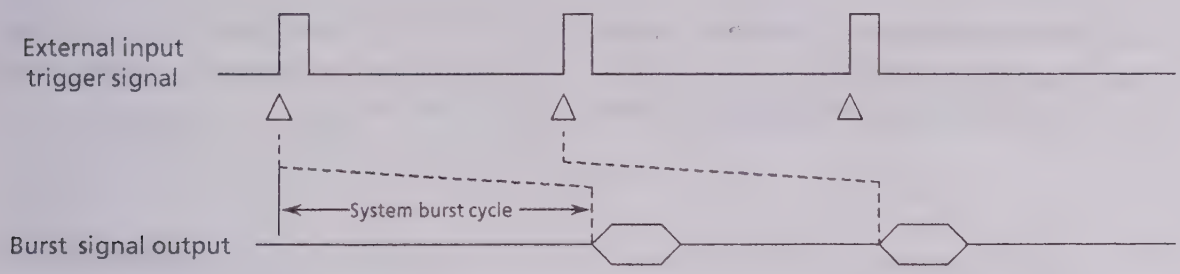
(c) Waveform : The waveform below illustrates a rising edge trigger waveform



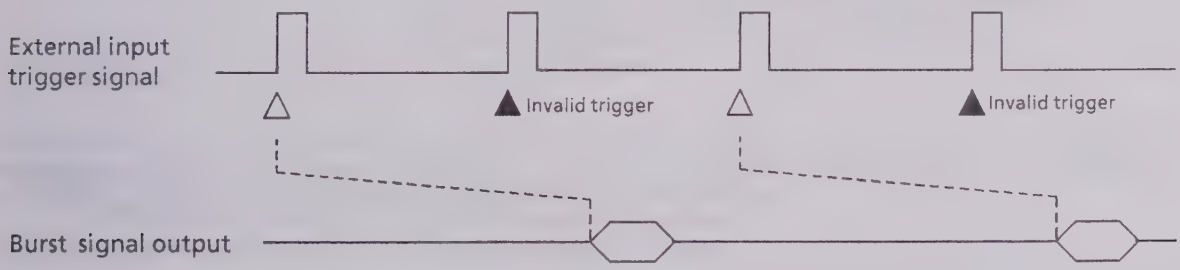

T1 : ≧0.1 μs
T2 : ≧0.1 μs
T3 : burst cycle (frame cycle) ± 1 symbol
Rising/falling time: 100 ns or less

## (2) Relationship between external input trigger signal and output burst signal

The figure below illustrates that the external input trigger signal is produced after a delay of one burst cycle.




**Note:** *If the period of the external input trigger signal does not satisfy the input condition in (1), the trigger signal is masked and invalidated as illustrated in the figure below. Therefore, the burst signal synchronized with the trigger signal cannot be obtained.*

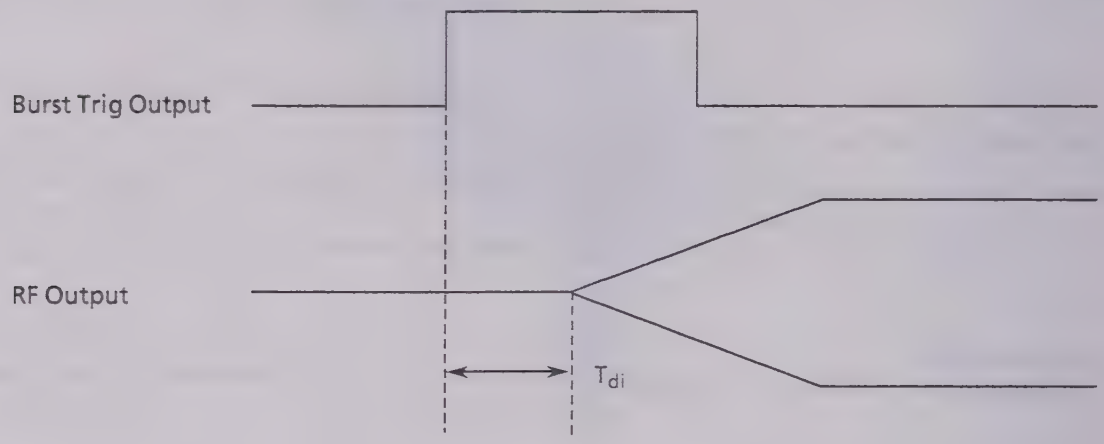


### 3.6.3 Output Timing of Burst Trigger and RF Signals

Pay attention to output timings of trigger and RF signals when synchronized with another equipment using the burst trigger signal of the MG3670 series • MG3660A. Relationships between trigger and RF signals are explained below.

#### (1) When internal trigger signal is used

The output timing of RF signal is shown below when synchronized with another equipment using the Burst TrigOutput signal from the MG3670 series • MG3660A rear panel.




$T_{di}$: Represents the delay time when burst wave is output using the internal trigger signal, which corresponds to the time from trigger until the start up of the first slot in the frame.

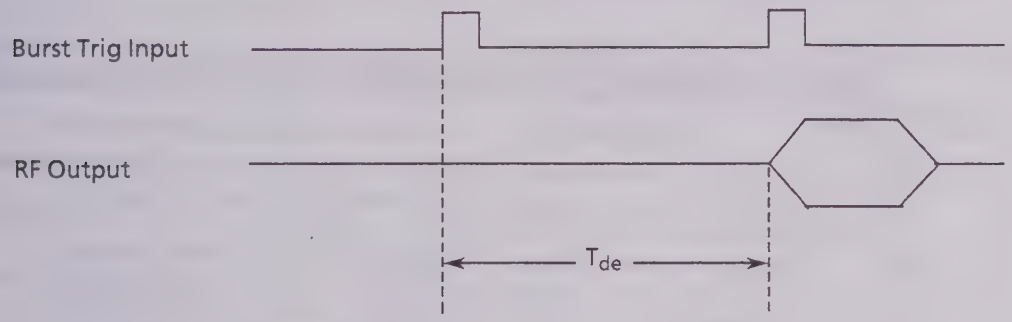
**Relationships between communication system and $T_{di}$**

| Communication system | Delay time $T_{di}$ ( ) indicates symbol converted value. |
|---|---|
| PDC | 20.3±0.5 μs (0.426 ± 0.011 symbol) |
| PHP | 2.44±0.10 μs (0.468 ± 0.019 symbol) |
| NADC | 17.8±0.5 μs (0.433 ± 0.014 symbol) |
| TFTS | −5.8±0.5 μs (−0.128 ± 0.011 symbol) |
| PDC_H | 20.3±0.5 μs (0.426 ± 0.011 symbol) |

***CAUTION:*** *$T_{di}$ includes error from system to system and is unique to each system, excluding the jitter.*

## (2) When external trigger signal is used

The output timing of RF signal is shown below when synchronized with another equipment using the Burst TrigIntput signal to the MG3670 series • MG3660A rear panel. The RF signal is output with a delay equivalent to approximately 1 frame period ($T_{de}$) of the communication system from the trigger signal. This matches the timing of the second trigger signal to that of the RF output when a trigger signal meeting the communication system is input.




$T_{de}$: Represents the delay time when burst wave is output using the external trigger signal, which corresponds to the time from trigger until the start up of the first slot in the frame.

When an external trigger signal is used, the Tde value varies according to the mean used for synchronizing the MG3670 series • MG3660A with the trigger signal source equipment. The following explains $T_{de}$ values by synchronization methods.

### (A) When connecting only with trigger signal

The delay time is calculated using the formula below when only the trigger signal is input to the MG3670 series • MG3660A:

$T_{de1}$ = Frame period of communication system + $T_{di}$ ± Synchronization error (1/16 symbol)

$T_{de1}$: Delay time for connection only by trigger signal
$T_{di}$: Delay time for operation with internal trigger signal
Synchronization error: Jitter occurs within ± 1/16 symbol since the MG3670 series • MG3660A is not synchronized with the external trigger signal source.

***CAUTION:*** *When the MG3670 series • MG3660A is synchronized with the external trigger signal source using the 10/13 MHz reference signal, no jitter occurs. The jitter value is inconsistent within a range ±1/16 symbol the synchronization error.*

**Relationships between communication system and $T_{de1}$**

| Communication system | Delay time $T_{de1}$ | ( ) indicates symbol converted value. |
|---|---|---|
| PDC | 20 ms + (20.3±3.5) μs | {1 frame+(0.426 ± 0.074 symbol)} |
| PHP | 5 ms + (2.44±0.43) μs | {1 frame+(0.468 ± 0.083 symbol)} |
| NADC | 20 ms + (17.8±3.1) μs | {1 frame+(0.433 ± 0.076 symbol)} |
| TFTS | 80 ms + ((−5.8)±3.4) μs | {1 frame+(−0.128 ± 0.075 symbol)} |
| PDC_H | 40 ms + (20.3±3.5) μs | {1 frame+(0.426 ± 0.074 symbol)} |

## (B) When Data Clock and Symbol Clock are connected

Delay times are calculated using the formula below when trigger signal is input to the MG3670 series • MG3660A with Data Clock and Symbol Clock connected:

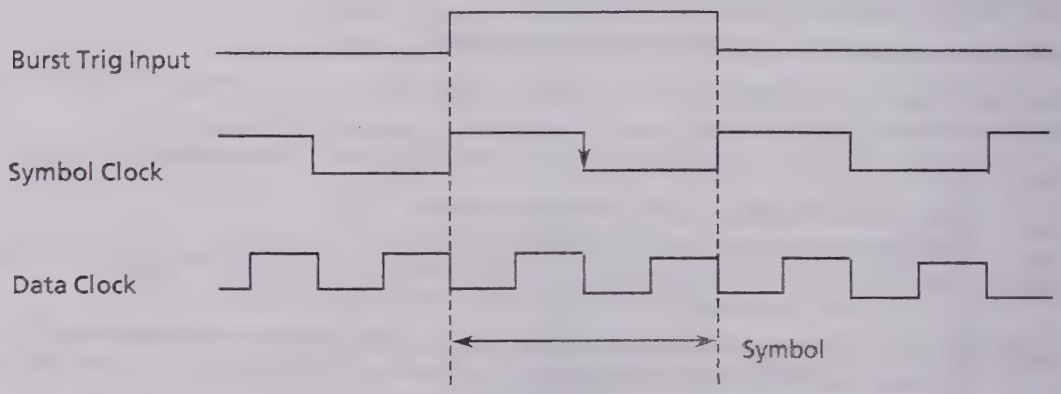
$T_{de2}$ = (Frame period of communication system) + $T_{di}$

$T_{de2}$: Delay time when trigger signal, Data Clock and Symbol Clock are connected
$T_{di}$: Delay time when operated using the internal trigger signal

### Relationships between communication system and $T_{de2}$

| Communication system | Delay time $T_{de2}$ | ( ) indicates symbol converted value. |
|---|---|---|
| PDC | 20 ms + (20.3 ± 0.5) μs | {1 frame + (0.426 ± 0.011)} symbol |
| PHP | 5 ms + (2.44 ± 0.10) μs | {1 frame + (0.468 ± 0.019)} symbol |
| NADC | 20 ms + (17.8 ± 0.5) μs | {1 frame + (0.433 ± 0.014)} symbol |
| TFTS | 80 ms + ((−5.8) ± 0.5) μs | {1 frame + (−0.128 ± 0.011)} symbol |
| PDC_H | 40 ms + (20.3 ± 0.5) μs | {1 frame + (0.426 ± 0.011)} symbol |

The figure below shows timings of Data Clock, Symbol Clock and trigger signals. (When polarities of all signals are positive)



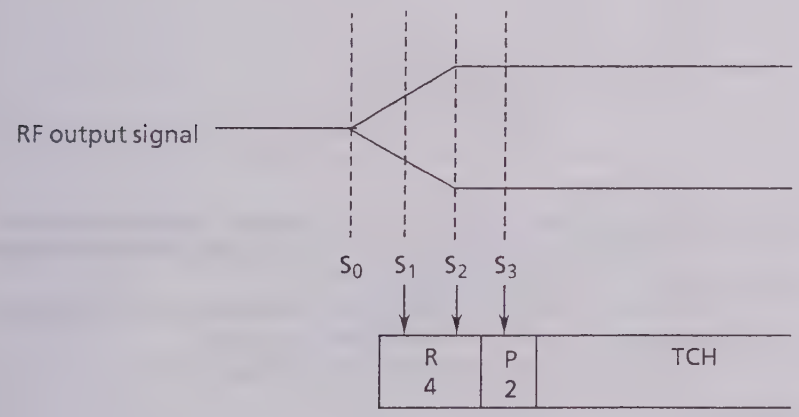

***CAUTION:*** *Although it is possible to operate without inputting the Symbol Clock, phase relationships between the Symbol Clock and trigger signals will be undefined. In this case, adjust the phase relationships between the MG3670 series • MG3660A and Symbol Clock of the trigger signal source as shown above using the Symbol Adjust key. When Data Clock is used for synchronization, the trigger signal input timing is adjusted in 1 symbol steps since the Symbol Clock monitors the Burst Trig Input signal.*

### 3.6.4 Relationships Between RF Signal and Symbol Judgment Point

Relationships between the RF output signal and symbol judgment point vary according to the communication system. The relationships are, therefore, explained for each system. Here, the symbol judgment point is defined as the point where the impulse response of the base band filter is the maximum.

#### (1) PDC / PDC__H system

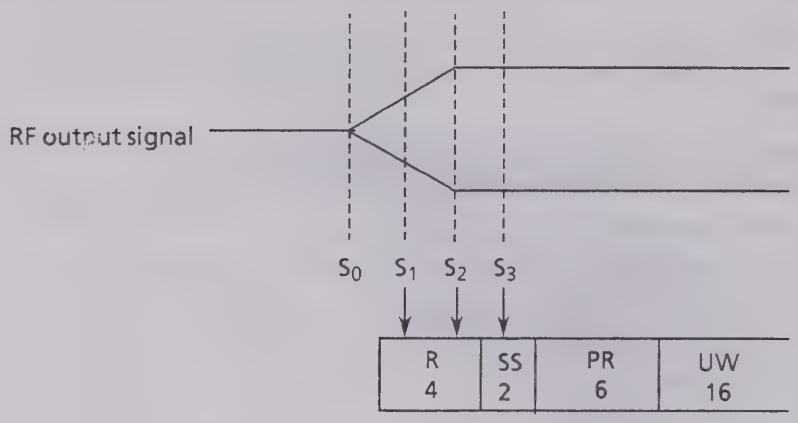
Relationships between modulation data against the RF signal and the symbol judgment point is explained using slot 0 of the uplink traffic channel as an example.




$S_1$: First symbol generated by the burst transient response ramp bit
$S_2$: Second symbol generated by the burst transient response ramp bit
$S_3$: Symbol generated by the pre-amble
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to $S_0$.
(For details on delay time, refer to Paragraph 3.6.3.)

## (2) PHP system

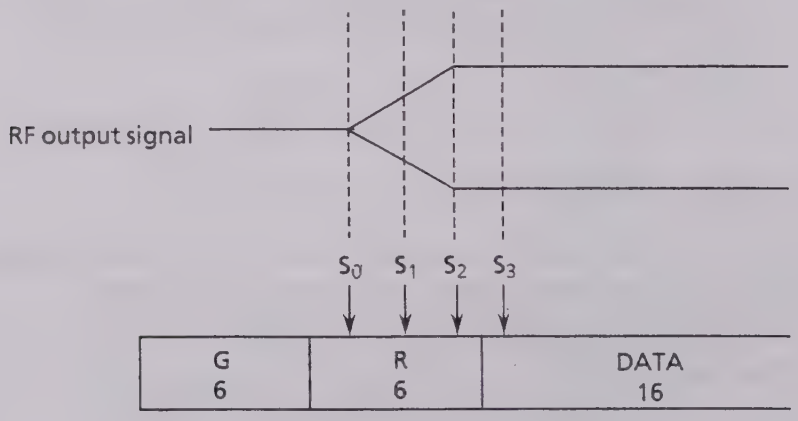
Relationships between modulation data against the RF signal and the symbol judgment point is explained using slot 1 of the downlink traffic channel as an example.




$S_1$: First symbol generated by the burst transient response ramp bit
$S_2$: Second symbol generated by the burst transient response ramp bit
$S_3$: Symbol generated by the start symbol
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to $S_0$.
(For details on delay time, refer to Paragraph 3.6.3.)

## (3) NADC system

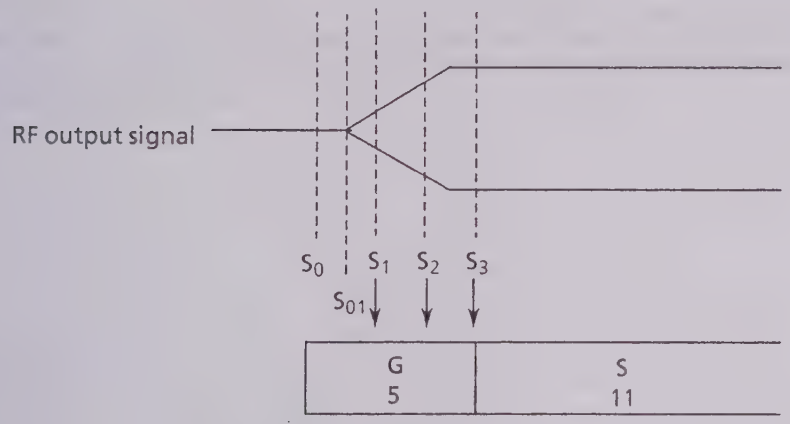
Relationships between modulation data against the RF signal and the symbol judgment point is explained using slot 0 of the uplink traffic channel as an example.




$S_0$: First symbol generated by the burst transient response ramp bit
$S_1$: Second symbol generated by the burst transient response ramp bit
$S_2$: Third symbol generated by the burst transient response ramp bit
$S_3$: First symbol generated by data
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to $S_0$.
(For details on delay time, refer to Paragraph 3.6.3.)

## (4) TFTS system

Relationships between modulation data against the RF signal and the symbol judgment point is explained using slot 1 of the downlink traffic channel as an example.




$S_1$: Symbol generated by the burst transient response guard ramp bit (corresponds to 1 to 2 bits)

$S_2$: Symbol generated by the burst transient response guard ramp bit (corresponds to 3 to 4 bits)

$S_3$: Symbol generated by 1 bit word synchronized to 5 bits of the burst transient response guard ramp bit
The delay time from burst trigger signal to start up of RF output is the same as that from burst trigger signal to $S_{01}$ (intermittent point between $S_0$ and $S_1$).
(For details on delay time, refer to Paragraph 3.6.3.)

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# SECTION 4
# MEASUREMENT

This section describes how to perform code error rate measurement for receivers, demodulator evaluation measurement, and modulator evaluation measurement using the MG0301C $\pi/4$ DQPSK Modulation Unit and the MG0303B Burst Function Unit in combination with the MG3670 series • MG3660A Digital Modulation Signal Generator.

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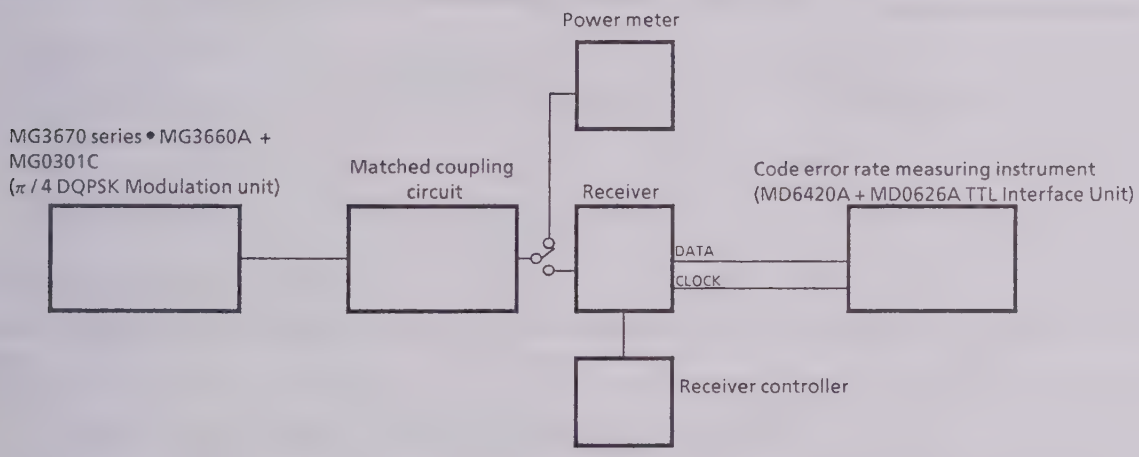
# SECTION 4
# MEASUREMENT

## 4.1 Code Error Rate Measurement for Receiver

The procedure for measuring a receiver code error rate using the MG3670 series • MG3660A + MG0301C system is described below. It is assumed that the receiver is equipped with a control mode that enables it to receive continuous waves.

### (1) Setup




### (2) Measurement procedure

| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A to the frequency to be tested. |
| 2 | Set the MG3670 series • MG3660A output to a level suitable for the receiver and the Matched coupling circuit. |
| 3 | Set the MG3670 series • MG3660A to the modulation system of the receiver. |
| 4 | Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern. |
| 5 | Connect the MG3670 series • MG3660A RF output to the power meter through the Matched coupling circuit. Using the power meter, adjust the MG3670 series • MG3660A output to the sensitivity test level. |
| 6 | Switch the Matched coupling circuit output to the receiver. |
| 7 | Using the receiver controller, set the receiver to the continuous wave reception mode. |
| 8 | Connect the receiver demodulation data output and data clock to the code error rate measuring instrument. |

The procedure when the code error rate measuring instrument used is Anritsu's MD6420A Data Transmission Analyzer is described below.

| Step | Procedure |
|---|---|
| 9 | Connect the data and clock obtained from the receiver to the RD (Data) and RT (Clock) connectors of the TTL Interface Unit (MD0626A) on the rear panel of the MD6420A. |
| 10 | Set the MD6420A receive timing as follows:<br>• If data is sampled at the rising edge of the clock, set to RT (INV) mode.<br>• If data is sampled at the falling edge of the clock, set to RT mode. |
| 11 | Set the MD6420A pattern to $2^9-1$ (PN9). |
| 12 | Press the MD6420A MEAS key to measure the code error rate. |

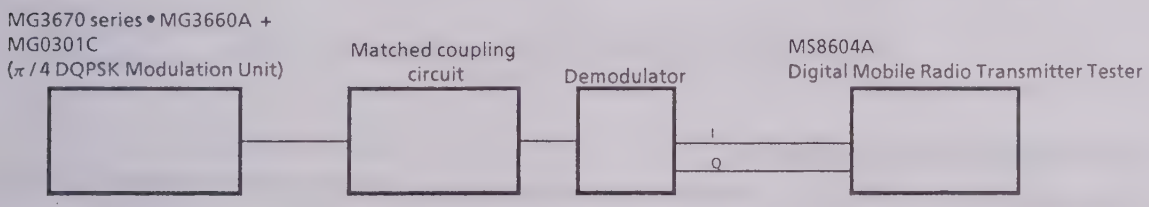
## 4.2 Demodulator Evaluation Measurement

The procedure for performing the evaluation measurement for a demodulator using the MG3670 series • MG3660A + MG0301C system is described below.

It is assumed that Anritsu's MS8604A Digital Mobile Radio Transmitter Tester is used in evaluating the demodulator I/Q signal output. Please note that the MS8604A requires the I-Q input function (option 03).

If the MG0303B Burst Function Unit is incorporated in the MG3670 series • MG3660A, it is also possible to perform evaluation using burst signals.

### (1) Setup




### (2) Measurement procedure

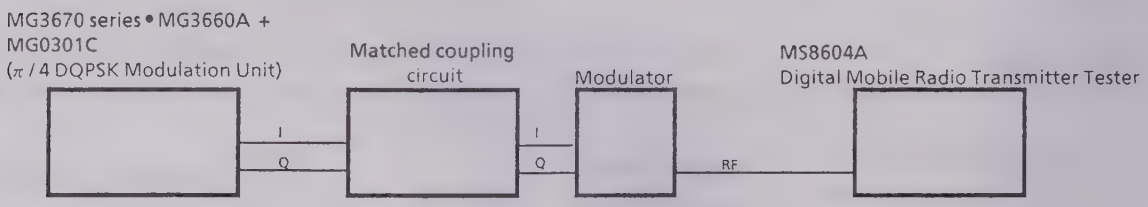
| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A to the frequency to be tested. |
| 2 | Set the MG3670 series • MG3660A output to a level suitable for the demodulator and the Matched coupling circuit. |
| 3 | Set the MG3670 series • MG3660A to the modulation system to be tested. |
| 4 | Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern. (If the MG0303B is incorporated, burst signal can also be set.) |
| 5 | Set the MS8604A so that the modulation system and pattern set in steps 3 and 4 can be received. |
| 6 | Using the MS8604A, measure the modulation accuracy and evaluate it. (For information on the MS8604A operation, refer to the MS8604A Operation Manual.) |

## 4.3 Modulator Evaluation Measurement

The procedure for performing evaluation measurement for a modulator using the MG3670 series • MG3660A + MG0301C system is described below.

It is assumed that Anritsu's MS8604A Digital Mobile Radio Transmitter Tester is used in evaluating the modulator modulation signal output.

### (1) Setup




### (2) Measurement procedure

| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A I, Q signal output to a level suitable for the modulator and the Matched coupling circuit. |
| 2 | Set the MG3670 series • MG3660A to the modulation system to be tested. |
| 3 | Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern. |
| 4 | Set the MS8604A so that the modulation system and pattern set in steps 2 and 3 can be received. |
| 5 | Using the MS8604A, measure the modulation accuracy and evaluate it. (For information on the MS8604A operation, refer to the MS8604A Operation Manual.) |

# SECTION 5
# PERFORMANCE TESTS

This section describes the measuring instruments needed for performance tests, setup, and procedures using the MG0301C $\pi/4$ DQPSK Modulation Unit and the MG0303B Burst Function Unit in combination with the MG3670 series • MG3660A Digital Modulation Signal Generator. These performance tests are performed to check if the main performance parameters of the MG0301C and the MG0303B satisfy standard levels.

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# SECTION 5
# PERFORMANCE TESTS

## 5.1 Performance Tests Requirement

Performance tests are performed as preventive maintenance to prevent performance deterioration. Performance tests are required at acceptance inspection, periodic inspection, and post-repair performance verification.

The following are the items that should be tested for verifying the performance of the MG0301C:

- I/Q signal modulation accuracy
- RF output modulation accuracy
- Modulation pattern

The following are the item that should be tested for verifying the performance of the MG0303B:

- Burst signal On/Off ratio

When used in combination with the MG3670 series • MG3660A (main instrument), conduct the following performance test:

- Leakage power of adjacent channel characteristics

Execute performance tests periodically as preventive maintenance for important items. They should be executed at least once or twice a year to check performance. Contact the ANRITSU service department if the MG0301C or MG0303B fails to meet the specifications during performance tests.

## 5.2 Instruments Required for Performance Tests

The table below lists the measuring instruments required for the performance tests.

| Recommended instrument (Anritsu model) | Required performance[†1] | Test items |
|---|---|---|
| Digital Mobile Radio Transmitter Tester (MS8604A) | 400 kHz to 2.25 GHz[†2] | • I/Q signal modulation accuracy<br>• RF output modulation accuracy |
| Data Transmission Analyzer (MD6420A)[†3] | 42 to 384 kbps | • Modulation pattern |
| Spectrum Analyzer (MS2602A) | 300 kHz to 5 GHz | • Burst signal On/Off ratio |

[†1] Only part of the performance that covers the test item measurement range is extracted.
[†2] The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.
[†3] Error rate measuring instrument

## 5.3 Performance Tests

Before executing the performance tests explained on the following pages, unless otherwise specified, the instrument under test and all the other measuring instruments must be warmed-up for at least 30 minutes so the test is executed under stable conditions. To measure at the highest accuracy, the tests must be performed at room temperature, and ac power-supply voltage fluctuations must be minimized, and vibration and humidity must be kept at a reasonable level.

### 5.3.1 I/Q signal modulation accuracy

Verify the modulation accuracy of the I/Q signal output.

#### (1) Test specifications

- Modulation accuracy ..... 1.5 %rms (at 50 Ω, 500 mVrms output)

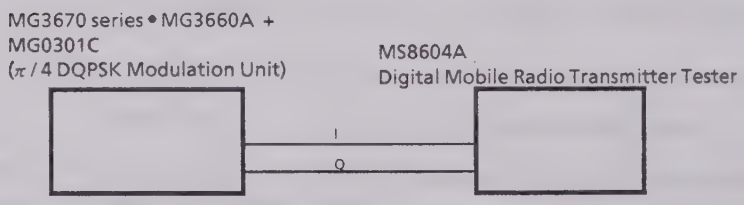
#### (2) Test instrument

- Digital Mobile Radio Transmitter Tester ..... MS8604A

MS8604A options needed for measurement work:

Option 03: IQ input ..... Used in the analysis of I/Q signals
Option 11: PDC software ..... Used in the analysis of PDC signals
Option 12: PHP software ..... Used in the analysis of PHP signals
Option 13: NADC software ..... Used for the analysis of NADC signals

#### (3) Setup




#### (5) Test procedure

| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A I/Q output level to 50 Ω / 500 mVrms. |
| 2 | Set the MG3670 series • MG3660A to the modulation system to be tested. |
| 3 | Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern. |
| 4 | Set the MS8604A so that the modulation system and pattern set in steps 2 and 3 can be received. |
| 5 | Using the MS8604A, measure the modulation accuracy and the I/Q signal. |

| Step | Procedure |
|---|---|
| | When an MG0303B burst function unit is installed, perform steps 6 to 9. |
| 6 | Set the MG3670 series • MG3660A burst function to On. |
| 7 | Set the modulation pattern to the communications channel. |
| 8 | Set the MS8604A so that the pattern set in step 7 can be received. |
| 9 | Using the MS8604A, measure the modulation accuracy and the I/Q signal. (For information on the MS8604A operation, refer to the MS8604A Operation Manual.) |

## 5.3.2 RF output modulation accuracy

Verify the modulation accuracy of the RF modulation signal output.

### (1) Test specifications

- Frequency range ..... 300 kHz to 2.25 GHz† (PDC, NADC,PDC_H)
  1 MHz to 2.25 GHz† (PHP)
- Modulation accuracy
  ..... 1.8% rms (at ≦ +5 dBm output level, installed in the MG3670B/3671A)
  2.5% rms (at +5 dBm output level, installed in the MG3660A)

***Note:*** *The 300 to 400 kHz ranges of PDC and NADC and the 1 to 10 MHz range of PHP cannot be measured with the MS8604A.*

†: The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.

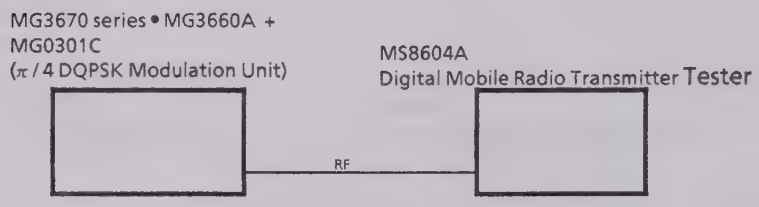
### (2) Test instrument

- Digital Mobile Radio Transmitter Tester ..... MS8604A

MS8604A options needed for measurement work:

| | | |
|---|---|---|
| Option 11: | PDC software ..... | Used in the analysis of PDC signals |
| Option 12: | PHP software ..... | Used in the analysis of PHP signals |
| Option 13: | NADC software ..... | Used for the analysis of NADC signals |

### (3) Setup




### (4) Test procedure

| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A to the frequency to be tested. |
| 2 | Set the MG3670 series • MG3660A output level to +5 dBm. |
| 3 | Set the MG3670 series • MG3660A to the modulation system to be tested. |
| 4 | Set the MG3670 series • MG3660A modulation pattern to PN9 pseudorandom pattern. |
| 5 | Set the MS8604A so that the modulation system and pattern set in steps 3 and 4 can be received. |
| 6 | Using the MS8604A, measure the modulation accuracy of the RF modulation signal. |
| | When an MG0303B burst function unit is installed, perform steps 7 to 10 |
| 7 | Set the MG3670 series • MG3660A burst function to On. |

| Step | Procedure |
|---|---|
| 8 | Set the modulation pattern to the communications channel. |
| 9 | Set the MS8604A so that the pattern set in step 8 can be received. |
| 10 | Using the MS8604A, Measure the modulation accuracy of the RF modulation signal (For information on the MS8604A operation, refer to the MS8604A Operation Manual.) |

### 5.3.3 Modulation pattern

Verify the modulation pattern.

#### (1) Test specifications

- PN9 and PN15 pseudorandom pattern ..... Burst function Off
- PN9 and PN15 pseudorandom pattern on slot ..... Burst function Off

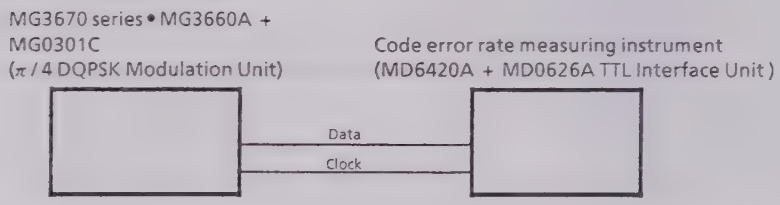
#### (2) Test instrument

- Data Transmission Analyzer ..... MD6420A

  MD6420A unit needed for measurement work:

  MD0626A ..... TTL Interface Unit

#### (3) Setup




#### (4) Test procedure

| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A to the modulation system to be tested. |
| 2 | Set the MG3670 series • MG3660A modulation pattern to PN9/PN15 pseudorandom pattern. |
| 3 | Connect the MG3670 series • MG3660A data output and data clock to the code error rate measuring instrument. (Connect the data and the clock to the RD (Data) and RT (clock) connectors of the TTL Interface Unit (MD0626A) inserted on the MD6420A rear panel, respectively.) |
| 4 | Set the MD6420A receive timing to RT (INV) mode. |
| 5 | Set the MD6420A pattern to $2^9-1$ (PN9) and $2^{15}-1$ (PN15). |
| 6 | Press the MD6420A MEAS key to measure the code error rate. |
| | When the MG0303B burst function unit is installed, perform steps 7 to 12. |
| 7 | Set the MG3670 series • MG3660A burst function to On. |
| 8 | Set the modulation pattern to the communications channel. |
| 9 | Set TCH (Traffic Channel) to PN9/PN15 pseudorandom pattern. |

| Step | Procedure |
|---|---|
| 10 | Set the Pattern Sync output signal to PN Clock. |
| 11 | Set the MD6420A pattern to $2^9-1$ (PN9) and $2^{15}-1$ (PN15). |
| 12 | Press the MD6420A MEAS key to measure the code error rate. |

***Note:*** • *Set the polarity of the MG3670 series • MG3660A data output to positive.*
• *For information on the MD6420A operation, refer to the MD6420A Operation Manual.*

## 5.3.4 Burst signal On/Off ratio

Verify the On/Off ratio of the burst signal output.

### (1) Test specifications

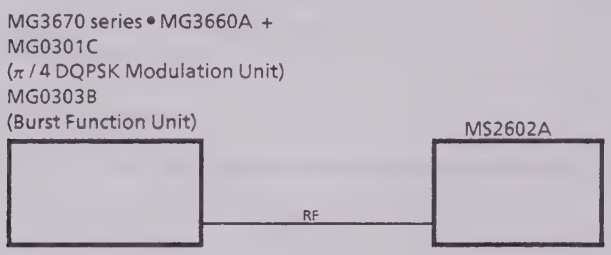
- Frequency range ..... 300 kHz to 2.25 GHz† (PDC, NADC,TFTS, PDC_H)
  1 MHz to 2.25 GHz† (PHP)
- On/Off ratio ..... ≧80 dB: at 5 dBm output, installed in the MG3670B/3671A
  (PDC, NADC, TFTS, PDC_H)
  ≧75 dB: at 5 dBm output, installed in the MG3660A
  (PDC, NADC, TFTS, PDC_H)
  ≧75 dB: at 5 dBm output (PHP)

†: The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.

### (2) Test instrument

- Spectrum analyzer ..... MS2602A

### (3) Setup




### (4) Test procedure

| Step | Procedure |
|---|---|
| 1 | *Set the MG3670 series • MG3660A to the frequency to be tested.* |
| 2 | Set the MG3670 series • MG3660A output level to +5 dBm. |
| 3 | Set the MG3670 series • MG3660A to the modulation system to be tested. |
| 4 | Set the MG3670 series • MG3660A burst function to On. |
| 5 | Set the MS2602A to the frequency to be tested. |
| 6 | Set the MS2602A sweep frequency width to 0 Hz, and observe the output level on and off condition in the time domain. |
| 7 | Set the MS2602A parameters to suitable levels, and measure the On and Off ratio. *(For information on the MS2602A operation, refer to the MS2602A Operation Manual.)* |

## 5.3.5 Leakage power of adjacent channel characteristics

Check the leakage power of adjacent channel characteristics as instructed below.

### (1) Test specifications

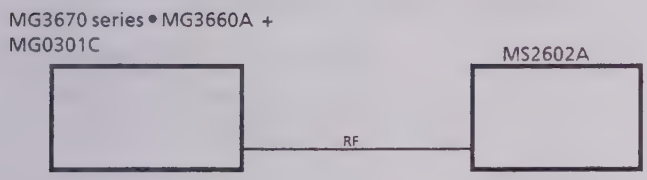
- Frequency range ..... 1 to 2.25 GHz† (PHP)
- Leakage power of adjacent channel ratio
  ..... ≦ −74 dB: MG3670B/3671A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz
  ≦ −69 dB: MG3660A, 600 kHz/900 kHz offset, ±96 kHz bandwidth, ≧10 MHz

†: The frequency upper limit conforms to specifications of the MG3670 series • MG3660A.

### (2) Test instrument

- Spectrum analyzer ..... MS2602A
  (with leakage power of adjacent channel measurement function)

### (3) Setup




### (4) Test procedure

| Step | Procedure |
|---|---|
| 1 | Set the MG3670 series • MG3660A to the frequency to be tested. |
| 2 | Set the output level, for example, to −10 dBm. |
| 3 | Set the modulation to On and the communications system to PHP. |
| 4 | Set the modulation pattern to PN9.<br>For a model with burst function, conduct the test with the burst function set to On. |
| 5 | Set the MS2602A to the frequency of Step 1. |
| 6 | Set the MS2602A sweep frequency width to about 1 MHz. |
| 7 | Set the MS2602A sweep time to 5 s or more. |
| 8 | Set other parameters of the MS2602A to optimum levels. |
| 9 | Measure the leakage power of adjacent channel ratio using the leakage power of adjacent channel ratio measurement function.<br>(For information on the MS2602A operation, refer to the MS2602A Operation Manual.) |

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# SECTION 6
# STORAGE AND TRANSPORTATION

This section describes the long-term storage, repacking and transportation of the MG0301C $\pi$/4 DQPSK Modulation Unit and MG0303B Burst Function Unit.

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# SECTION 6
# STORAGE AND TRANSPORTATION

## 6.1 Storage Precautions

This paragraph describes the precautions to take for long-term storage of the MG0301C and MG0303B.

### 6.1.1 Precautions before storage

Avoid storing the MG0301C and MG0303B where:

1) It may be exposed to direct sunlight or high dust levels.
2) It may be exposed to high humidity.
3) It may be exposed to active gases.
4) It may be exposed to extreme temperatures ( $< -40°C$ or $> 70°C$ ) or high humidity ( $\geqq 90\%$ ).

### 6.1.2 Recommended storage precautions

The recommended storage conditions are as follows:

- Temperature ..... 0 to 30°C
- Humidity ..... 40% to 80%
- Stable temperature and humidity over 24-hour period

## 6.2 Repacking and Transportation

The following precautions should be taken if the MG0301C/MG0303B must be returned to Anritsu Corporation for servicing.

### 6.2.1 Repacking

Use the original packing materials. If the MG0301C/MG0303B is packed in other materials, observe the following packing procedure:

(1) Wrap the MG0301C/MG0303B in a plastic sheet or similar material.

(2) Use a cardboard, wooden box, or aluminum case which allows shock-absorbent material to be inserted on all sides of the equipment.

(3) Use enough shock-absorbent material to protect the MG0301C/MG0303B from shock during transportation and to prevent it from moving in the container.

(4) Secure the container with packing straps, adhesive tape or bands.

### 6.2.2 Transportation

Do not subject the MG0301C/MG0303B to severe vibration during transport. It should be transported under the storage conditions recommended.

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